C: Bill (2)
Kevin
BRO

Micron®

Micron Technology, Inc.
8000 S. Federal Way
P.O. Box 6
Boise, ID 83707-0006
208.368.4000

June 22, 2006

RECEIVED
JUN 22 2006
R. Greenwood DEQ

HAND DELIVERED

Mike Simon
State Office
Air Quality Division
1410 N. Hilton
Boise, Idaho 83706

Reference: Micron Technology, Inc. Revised Tier II Operating Permit Application

Dear Mr. Simon:

Enclosed is Micron Technology, Inc.'s (MTI) Tier II operating permit application for the semiconductor manufacturing facility located at 8000 S. Federal Way, Boise, Idaho 83707, 7560 S. Federal Way, and 3851 E. Columbia Road. The application was prepared in accordance with the provisions of IDAPA 58.01.01.402, 202, and 177. This application is an update of the Tier II operating permit application submitted to DEQ on March 14, 2003. MTI requests that the information contained in this application be used in processing the Tier II operating permit.

Based on information and belief formed after reasonable inquiry, the information contained in this Tier II operating permit and permit to construct application is true, accurate, and complete.

If you have any questions or require additional information, please contact Dustin Holloway at (208) 368-4000.

Sincerely,

MW
Jay Hawkins
Vice President of Operations

COPY

DE/dh

Enclosures

Permit No.: T2-060033

Facility ID No.: 001-00044

PID: 55 BG. X00020 PTCS

Logged: M

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JUN 22 2006

Department of Environmental Quality
State Air Program

Tier II Permit Application and Permit to Construct Application (Revision 1)

Boise, Idaho

Prepared for:

Micron Technology, Inc.
8000 S. Federal Way
Boise, Idaho 83716

Prepared by:

Geomatrix Consultants, Inc.
19203 36th Avenue W, Suite 101
Lynnwood, Washington 98036
(425) 921-4000

June 2006

Project No. 010543

Geomatrix

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APPENDICES

ACRONYMS

AAC	Acceptable Ambient Concentration
AACC	Acceptable Ambient Concentration for Carcinogens
CAAA	Clean Air Act Amendments
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DEQ	Idaho Department of Environmental Quality
DI	Deionized water
EL	Emission Limit
EPA	U.S. Environmental Protection Agency
FEC	Facility Emissions Cap
HCl	Hydrochloric Acid
HF	Hydrofluoric Acid
IDAPA	Idaho Administrative Procedures Act
MACT	Maximum Achievable Control Technology
MTI	Micron Technology, Inc.
NESHAP	National Emission Standards for Hazardous Air Pollutants
NSPS	New Source Performance Standards
NO_x	Nitrogen Oxides
OVC	Operational Variability Component
PM-10	Particulate Matter with an aerodynamic diameter of 10 µm or less
PSD	Prevention of Significant Deterioration
PTC	Permit to Construct
SO_2	Sulfur Dioxide
TDS	Total Dissolved Solids
UTM	Universal Transverse Mercator
VOC	Volatile Organic Compounds

TIER II OPERATING PERMIT APPLICATION AND APPLICATION FOR A PERMIT TO CONSTRUCT (REVISION 1)

Micron Technology, Inc.

1.0 INTRODUCTION

This application is submitted for Micron Technology, Inc.'s (MTI's) semiconductor manufacturing facility and related operations at 8000 South Federal Way, Boise, Idaho 83707, 7560 S. Federal Way, and 3851 E. Columbia Road (hereafter, the "Facility"). The Facility is governed by a Tier I operating permit issued on December 24, 2002.

Under condition 4.10 of the Tier I permit, MTI agreed to apply for a Tier II permit. During the fall of 2002 and winter of 2003, DEQ and MTI discussed the scope, content, and methodology for the Tier II application. MTI submitted a Tier II permit application on March 14, 2003. On June 2, 2003, the Idaho Department of Environmental Quality (DEQ) deemed the application complete. A copy of DEQ's completeness determination is attached as Appendix A.

This application is a voluntary revision to update the 2003 Tier II permit application. In preparation of this revised application, MTI staff met with DEQ staff a number of times in spring 2005. In May 2005, DEQ staff members toured the Facility and were briefed on the systems MTI uses to calculate air emissions. Concurrently, during 2004 and 2005, MTI staff, DEQ staff, other industry representatives, and environmental groups participated in the negotiated rulemaking to develop the Facility Emission Cap (FEC) rule. The FEC rule was approved by the Board of Environmental Quality on November 17, 2005. The terms and conditions of the FEC rule became effective on April 11, 2006.

Through its consultants, Geomatrix Consultants, Inc. (Geomatrix), MTI confirmed with DEQ modelers in June 2005 that the DEQ-approved protocol used in the 2003 Tier II permit application remained generally appropriate. This application reflects those discussions and the correspondence among DEQ, MTI environmental staff and Geomatrix.

The purposes of this application are to:

- Update the emission inventory,
- Refine proposed Facility emission caps (FECs),
- Propose permit terms,

- Authorize potential minor modifications to the Facility, including potential construction of additional manufacturing capacity, that may increase emissions under the proposed FEC,
- Incorporate terms of the Third Amended Consent Order into a Tier II permit, and
- Develop an alternative tracking system for substances listed at IDAPA 58.01.01.585 and 586.

MTI seeks the flexibility to construct minor modifications and to operate the Facility within the FEC limitations subject to a mutually agreeable compliance demonstration method.

This application addresses potential ambient impacts of anticipated changes at the Facility, with the objective of avoiding the need for additional modeling during the permit term. The application identifies Facility-wide emissions of criteria pollutants and substances listed at IDAPA 58.01.01.585 and 586. Using Boise meteorological data and a dispersion model recommended by the U.S. Environmental Protection Agency (EPA), the application identifies the maximum ambient concentrations of criteria pollutants and compares those predictions with established regulatory criteria. The modeling demonstrates the Facility will not cause or significantly contribute to a violation of any ambient air quality standards (IDAPA 58.01.01.203.02 and 403.02), even with the proposed increases in criteria pollutants under the proposed FECs.

1.1 Recent Rulemaking to Codify Facility Emissions Caps

On March 3, 2004, DEQ published notice of negotiated rulemaking, Docket 58-0101-0401, "to review the structure and efficiency of the air quality permitting rules to modernize, update, and clarify appropriate portions." The rulemaking participants concluded negotiation of a proposed rule to codify a mechanism to improve operational flexibility for industrial facilities that are minor sources of criteria pollutant emissions. The rule is intended to reduce administrative burdens on government and industry by providing advance approval of changes to facilities while also ensuring compliance with ambient air quality criteria. The Facility Emission Cap (FEC) rule established procedures to create emissions caps through the Permit to Construct or Tier II operating permit processes. A copy of the final rule is attached as Appendix B.

Semiconductor manufacturing facilities are good candidates for a FEC permit because such facilities routinely make numerous equipment, process, and recipe changes due to the development of new technologies, equipment, processes, and products, typically without any material effect on the nature or amount of emissions. In exchange for improving operational flexibility, a FEC sets Facility-wide emission limits.

1.2 ORGANIZATION

Chapter 2 of the application presents a description of the manufacturing processes at the Facility. Next, Chapter 3 of the application describes the sources of emissions and MTI's approach to calculating emission rates. Chapter 4 identifies the proposed FECs, describes how the proposed FECs were derived, and presents proposed permit conditions. Chapter 5 summarizes a conservative modeling assessment of the FECs to demonstrate that criteria pollutant emissions would not cause or significantly contribute to a violation of any ambient air quality criteria.

In addition to all the information required by IDAPA 58.01.01.202 and 402, DEQ requested an emissions inventory of substances listed at IDAPA 58.01.01.585 and 586. Though there are no regulatory requirements to submit nor criteria contained in the Rules to evaluate site wide emissions of the substances listed in section 585 or 586, MTI took the additional step of providing estimates of emissions of substances listed at IDAPA 58.01.01.585 and 586 as requested by the DEQ. These materials are addressed in Chapter 4. Micron also engaged Geomatrix to model Facility estimated future increases in emissions of substances listed at IDAPA 58.01.01.585 and 586; the results of the modeling are included in Chapter 4.

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2.0 PROCESS DESCRIPTION

MTI manufactures semiconductor devices (also called chips or die) on silicon wafers. A description of the manufacturing processes is outlined in detail below. The processes are currently conducted in varying degrees in the four fabrication areas at MTI: two production fabrication areas (Fab 1A and Fab 1B), one production support area (Fab 1C), and a research and development (R&D) area (Fab 4). Once fabrication is complete, chips are assembled and tested.

The Facility must constantly adapt to changing product mix, architecture, and functionality. The nature and rapid pace of constant technological change affects the type, number, and configuration of equipment (also known as "tools" in the industry) required to fabricate chips or die. The Fabs currently perform the basic processes described in detail below: cleaning, diffusion, photolithography, wet etch, dry etch, diffusion, implant, and metallization.

2.1 BACKGROUND

The semiconductor industry is well known for its rapid technological innovation. Because of the pace of innovation from the continual development of new equipment, processes, and other technologies, tools required to perform the processes (generally batch processes, not continuous assembly-line processes) often have useful lives of only three to five years. Equipment in more mature industries like lumber, pulp and paper or utilities may last 50 years or more. The memory business has historically incorporated new technology into production before other semiconductor producers (e.g., digital signal processors).

Most memory chips are virtually identical from one manufacturer to the next. Standard memory specifications developed by the industry make most computer memory interchangeable regardless of manufacturer. Most memory, therefore, is a commodity. In a commodity product business, the main opportunity to gain an advantage on the competition is by reducing the cost per part sooner than the competition.[1]

One of the keys to decreasing manufacturing cost is shrinking the die and the chip's components (e.g., transistors, capacitors, and circuitry). This is accomplished either by design changes (rewiring the circuitry or chip architecture) or by decreasing the feature size (line width) of the semiconductor circuitry through advances in photolithography. Semiconductor circuitry is a complex series of paths, like a road system, for conducting electricity. Imagine a road system with lanes ten feet wide, five layers deep, covering five square miles, with millions of on- and off-ramps. Now imagine designing and executing over time a gradual decrease in lane width to eight feet, then five, then three and a half, then two, and so on as the available real estate shrinks – all while still maintaining a functional road system. In semiconductor manufacturing, all this occurs at the sub-micron level.

Another key to decreasing manufacturing costs is increasing wafer size. By increasing wafer size, a manufacturer can hope to increase production output by producing more die from each wafer. MTI is constantly exploring opportunities to reduce manufacturing costs through die shrinking, increased wafer size, or other possibilities as part of its normal mode of operation, including routinely rearranging tools, processes, and chemistry.

New photolithography tools are required for the decreasing progression in line width. Just as you would expect in reengineering and rebuilding a road there will be inevitable collateral challenges that arise. Challenges may arise in other process areas as you decrease line width or modify the chip architecture to fit the smaller wafer real estate. New tools may be required for the other processes to overcome these new manufacturing challenges. The chip is built in a series of patterned layers with different materials on each layer requiring a different process step. Considerations must be given to how a material will be deposited, excess material removed, how that material will interact with a different material next to it or on top of it, and how subsequent processing of different materials will affect the first material. As the technology and chip design changes some tools may need to be changed to solve particular challenges. Some existing tools may continue to be useful and do not require replacement. There is no hard and fast rule. It requires a case-by-case evaluation each time the chip design or technology changes.

During the mid-1990s, the semiconductor industry underwent a transition from six- inch wafers to eight- inch (200mm) wafers. Similarly, the industry is currently transitioning to twelve inch (300mm) wafers. It is possible that at some point in the future the entire Facility may begin processing 300mm wafers. The growth component MTI requests allows for the potential conversion of the Facility to 300 mm wafers.

---

[1] A cost advantage allows one or more competitors to either remain profitable or suffer less financial harm when commodity prices drop.

2.2 MANUFACTURING

2.2.1 Fabrication

2.2.1.1 Cleaning

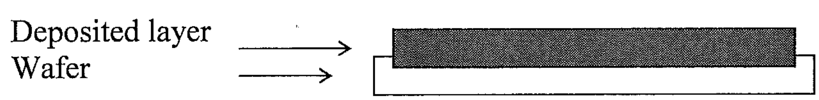
Silicon wafers are cleaned to remove particles and contaminants such as dust. Aqueous acid or acid mixtures are the most commonly used cleaning solutions. Use of acids is generally necessary because of the solubility characteristics of silicon, silicon oxide, and common contaminants. A variety of acids may be used depending on the nature of the material to be removed.

2.2.1.2 Diffusion

The next step in the process depends on the type (i.e., imager, flash, DRAM), of integrated circuit device being produced, but commonly involves the diffusion or growth of a layer or layers of silicon dioxide, silicon nitride, or polycrystalline silicon (see Figure 2-1). For example, an initial layer of silicon dioxide with the subsequent deposition of a silicon nitride layer is commonly applied to metal oxide silicon devices. Diffusion processes can be conducted at atmospheric pressure or in a vacuum chamber and are typically conducted at temperatures between 400 and 1200°C. Chemicals and gases necessary to obtain the desired effect are flowed for a limited time into the chambers where a reaction takes place, depositing a layer of the element or compound on the surface of the wafer. Wafer residence times in the chambers can range from several minutes to twenty-four hours. Several products containing VOCs may be used in the diffusion step depending on the desired composition of the layer. As gases react in the diffusion process, a small amount of particulate matter may be produced and emitted.

Figure 2-1

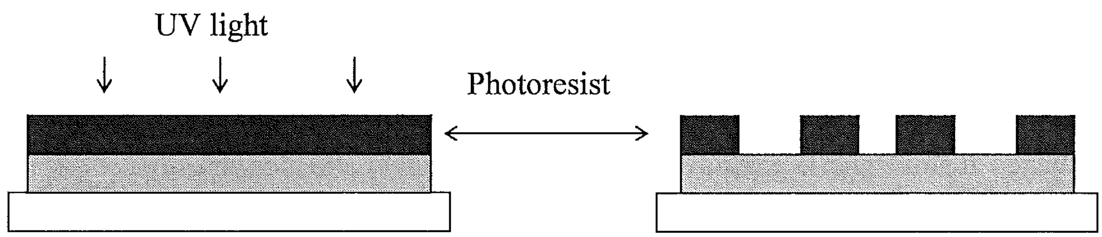
SCHEMATIC REPRESENTATION OF A WAFER AFTER DIFFUSION



2.2.1.3 Photolithography

The wafer then proceeds to the photo process. Vapor priming occurs first to remove any moisture present on the surface of the wafer to prepare it for optimum photoresist adhesion. The wafer continues on to coat tracks where it is coated with a photoresist, a photosensitive emulsion, followed by a rinse to remove excess photoresist from the edges and backside of the wafer. The wafer is next exposed to ultraviolet light using glass photomasks that allow the light to strike only selected areas and depolymerize the photoresist in these areas (see Figure 2-2). After exposure to ultraviolet light, exposed resist is removed from the wafer on develop tracks and rinsed off with deionized (DI) water. Some wafers may be further baked to harden the photo mask layer. This hard bake process, designed to cross-link and harden the polymers in the photoresist, occurs after the volatile constituents have been driven off. Photo allows subsequent processes to affect only the exposed portions of the wafer. Wafer residence times during chemical application in the photo process can vary from several seconds to ten or fifteen minutes.

Figure 2-2
SCHEMATIC REPRESENTATION OF A WAFER DURING AND AFTER PHOTO

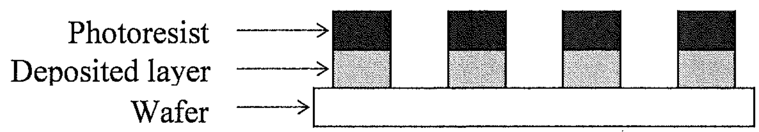


2.2.1.4 Etch

Etching of the wafer is then conducted to selectively remove deposited layers not protected by the photoresist material (see Figure 2-3). Either dry or wet etch processes may be used depending on the type of layer being removed. Dry etch uses a high energy plasma to remove the target layer. Process gases are ionized under vacuum pressure to form plasmas capable of etching specific layers. Wet etch may also be used to remove specific layers from the wafer. Some wet etch processes, however, also perform cleaning functions and prepare the wafer for subsequent processing. Wet etch is generally conducted at atmospheric pressure. Both etch processes may be conducted at ambient temperature or elevated temperatures (400°C or higher). Chemicals and gases used in both etch processes may be used in varying quantities depending on the specific objective of the etch being conducted. Wafer etching can be conducted for anywhere from two minutes to more than two hours. Some of the VOC-containing material used in etch processes may be discharged to either the hazardous waste or industrial wastewater collection systems.

Figure 2-3

SCHEMATIC REPRESENTATION OF A WAFER AFTER ETCHING

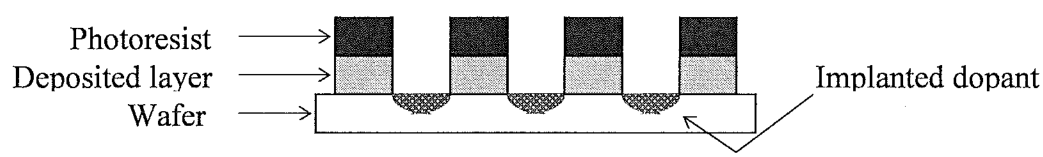


2.2.1.5 Doping (Diffusion and Implant)

Following etch the wafer moves on to a process where dopants are added to the wafer or layers. Dopants are impurities such as boron, phosphorus, or arsenic. Adding small quantities of these impurities to the wafer substrate alters its electrical properties. Implant and diffusion are two methods currently used to add dopants. During implant a chemical is ionized and accelerated in a beam to velocities approaching the speed of light. Scanning the beam across the wafer surface implants the energized ions into the wafer. A subsequent heating step, termed annealing, is necessary to make the implanted dopants electrically active. Diffusion is a vapor phase process in which the dopant, in the form of a gas, is injected into a furnace containing the wafers. The gaseous compound breaks down into its elemental constituents on the hot wafer surface. Continued heating of the wafer allows diffusion of the dopant into the surface at controlled depths to form the electrical pathways within the wafer (see Figure 2-4). Solid forms of the dopant may also be used. Implant is currently conducted in Fab 1C only.

Figure 2-4

SCHEMATIC REPRESENTATION OF A WAFER AFTER IMPLANT



2.2.1.6 Metallization

Metallization is a process that can be used to add metal layers to a wafer. Sputtering and vacuum deposition are forms of metallization that may be used to deposit a layer of metal on the wafer surface. In the sputtering process the source metal and the target wafer are electrically charged, as the cathode and anode, respectively, in a partially evacuated chamber. The electric field ionizes the gas in the chamber and these ions bombard the source metal cathode, ejecting metal which deposits on the wafer surface. In the vacuum deposition process the source metal is heated in a high vacuum chamber by resistance or electron beam heating to the vaporization temperature. The vaporized metal condenses on the surface of the silicon wafer. Some VOCs may be used in the diffusion process, but are generally not used in the implant or metallization processes.

2.1.1.7 Wafer-Level Packaging

Rather than being assembled into protective packages as described in Section 2.2.3, some semiconductor chips are processed further at the wafer level. Wafer level packaging consists of extending the wafer fabrication process to include device inter-connection and device protection processes.

2.1.1.8 Other Wafer Fabrication Steps

The wafer is then rinsed in an acid or solvent solution to remove the remainder of the hardened photoresist material. A second oxide layer is grown on the wafer and the process is repeated. This photolithographic-etching-implant-oxide process sequence may occur a number of times depending upon the application of the semiconductor. During these processes the wafer may be cleaned many times in acid solutions followed by DI water rinses and solvent drying. This is necessary to maintain wafer cleanliness. The rinsing and drying steps may involve the use of a VOC-containing material.

The wafer fabrication phase of manufacture ends with an electrical test (probe). Each die on the wafer is probed to determine whether it functions correctly. Defective die are marked to indicate they should be discarded. A computer-controlled testing tool quickly tests each circuit.

2.2.2 Fabrication of Masks

As noted above, the photo process employs photomasks. Photomasks (or masks), are very flat pieces of quartz or glass with a layer of chrome on one side. Circuit designs are etched into the chrome. The manufacturing process to produce a mask is similar to, but much simpler than the process to make a silicon-based electrical device. Production of silicon-based devices includes many steps and can take up to several months to manufacture; whereas, a mask requires relatively few steps and only about a week to manufacture. Masks are produced in the "Mask Shop" (Building 80), located in the northeast portion of the site.

The major steps involved in producing a mask are:

- Lithography

- Develop
- Etch
- Strip

These steps are very similar to those discussed above and utilize similar chemicals. The mask manufacturing process has lower emissions of VOCs than the wafer manufacturing process.

In May of 2006, the Mask Shop changed ownership. MTI entered into a joint venture with another company (Photronics) to produce masks. MTI is the majority owner of the new company called MP Mask LLC. MTI has determined that the Mask Shop is part of the Facility as it is under common control, located on contiguous property, and classified under the same Standard Industrial Classification as the Facility. IDAPA 58.01.01.006.36. Therefore, the Mask Shop is included in this permit application.

In addition, MTI recently entered into an agreement with Photronics to construct a second mask shop. The current plan is to locate the new mask shop at the Facility. See Figures L-1 and L-5 in the appendices. Emissions associated with the new mask shop, as of the date of this application, indicate that it is exempt from the requirement to obtain a PTC. The new building and associated emissions are addressed in Appendix G.

2.2.3 Assembly

After the fabrication processes are completed, most semiconductor chips are assembled into protective packages. The wafers are first mounted on tape in a metal frame where the wafer is sectioned by a wafer saw to separate the individual chips or die. Die are picked off the tape and attached to the bonding pad of a leadframe. Die attach cure ovens heat treat the die/leadframe assembly for several hours. The die is then connected to the legs of the leadframe by fine bonding wire. A protective coating is applied to the die and hardened in die coat cure ovens. The entire die is then encapsulated with a protective molding compound. The leadframe strip is trimmed and individual die leads formed. The legs of individual die packages are then plated to provide reliable electrical contacts. Individual die may then be sold as die or assembled further into memory modules. Several VOC-containing materials are used in the assembly process.

2.2.4 Test

After assembly or wafer level packaging, the complete die are run through a series of tests for classification and final checking. There are several different tests run during this phase. Tests are conducted at varying temperatures to check for early failure of the die and to verify the speed of each die. A final visual check of the die is conducted before they are packaged and shipped. No pollutants are currently emitted by the testing process.

2.3 SUPPORT OPERATIONS

Numerous operations are conducted at the MTI Facility in support of the manufacturing process. These include:

- natural gas boilers used to supply steam for general heating and humidification;
- cooling towers used to dissipate heat from non-contact cooling water;
- an industrial wastewater treatment plant used to treat manufacturing wastewater to levels suitable for either land application or discharge to a publicly owned treatment works;
- temporary storage of solid and liquid hazardous waste and secondary materials generated at MTI pending shipment to a licensed off-site treatment, storage, and disposal facility or for lawful reuse or other recycling;
- storage and dispensing of unleaded gasoline and diesel fuels;
- painting and welding in support of new construction and maintenance of existing equipment and facilities;
- maintenance of surfaces in production areas by general cleaning activities; and
- emergency equipment.

MTI also assembles printed circuit boards, assembles custom test equipment (i.e., Ambyx ovens), and provides finished product packaging, as well as other support operations as part of its Systems Integration Group (SIG).

3.0 SOURCES OF EMISSIONS AND EMISSION CALCULATIONS

This section addresses Facility emissions of regulated air pollutants (specifically, criteria pollutants and HAPs as defined by IDAPA 58.01.01.006.82) and pollutants listed at IDAPA 58.01.01.585 and 586.

Emission sources at the Facility are divided into the following general emission units: manufacturing processes, boilers, emergency equipment, and miscellaneous emission sources. Descriptions of these emission units follow.

3.1 MANUFACTURING PROCESSES

3.1.1 VOC and HAP Emissions Mass Balance

The manufacturing process is the principal source of VOC and HAP emissions from the Facility. VOC and HAP emissions from manufacturing processes are estimated based on a conservative mass balance method. In this section, MTI describes how VOC and HAP emissions are calculated and controlled. This section was previously presented in MTI's May 1999 Tier I permit application and was previously analyzed by DEQ (see page 18 of the Technical Memorandum supporting the Tier I permit issued December 24, 2002).

The mass balance method results in conservative emission estimates. The batch nature of the manufacturing process dictates that materials be used in different quantities and different ratios in each of the hundreds of different tools used. Also, as technology continually improves, there may be wholesale changes in the way tools operate or in the type or quantity of material required for a given process. A mass-balance method of estimating emissions can best account for these continuous variations in the production process.

With the exception of some support operations (e.g., general-production cleans, discussed below), most VOC-containing waste materials from manufacturing are segregated and handled as either hazardous waste or used in lawful recycling. Tracking the production of bulk hazardous waste and recycling activities allows a mass-balance calculation to estimate manufacturing emissions. Any VOCs or HAPs are assumed to be emitted if they cannot be accounted for in the bulk hazardous waste or recycling activities. This is a conservative approach, since the material constituents may also be consumed in the manufacturing process. This mass-balance method accounts for all sources of VOC or HAP emissions in the manufacturing process, including production, fugitive emissions, hazardous or volatile tank or line losses. For this reason, these specific sources of emissions are not fully described separately, but are instead included as part of the manufacturing emissions unit.

The quantity of materials issued from the central MTI warehouse and the quantity of bulk liquid hazardous waste and recycled materials shipped offsite are the basic elements of the mass-balance method. The basic concept of the mass-balance method is illustrated in Equation 1.

$$\begin{pmatrix} \textit{Constituents} \\ \textit{used in} \\ \textit{uncontrolled} \\ \textit{processes} \end{pmatrix} - \begin{pmatrix} \textit{Uncontrolled} \\ \textit{process} \\ \textit{constituents} \\ \textit{in trackable liquid} \\ \textit{wastes} \end{pmatrix} + \left[\begin{pmatrix} \textit{Constituents} \\ \textit{used in} \\ \textit{controlled} \\ \textit{processes} \end{pmatrix} - \begin{pmatrix} \textit{Controlled} \\ \textit{process} \\ \textit{constituents} \\ \textit{in trackable liquid} \\ \textit{wastes} \end{pmatrix} \times \left(1 - \frac{\begin{matrix} \textit{Control} \\ \textit{Equipment} \\ \textit{Efficiency} \end{matrix}}{100} \right) \right] \quad (1)$$

As discussed in Section 2.2, "Manufacturing," production materials containing VOCs and HAPs are used throughout the semiconductor manufacturing process and in related support operations. Most materials purchased for use at MTI are processed through a single warehouse. This warehouse records the type and quantity of materials received and provides temporary storage until they are required by the production or support areas. Chemical handlers at MTI are specifically tasked with providing materials to the production and support areas on an as-needed basis. Records are made of many materials issued to the chemical handlers from the warehouse. Some materials purchased for use at MTI are received and directly distributed in bulk quantities. Records of these bulk shipments are also retained.

$$\begin{pmatrix} \textit{Consituent} \\ \textit{used in} \\ \textit{process} \end{pmatrix} = \begin{pmatrix} \textit{Materials} \\ \textit{issued from} \\ \textit{warehouse} \end{pmatrix} + \begin{pmatrix} \textit{Materials} \\ \textit{received} \\ \textit{in bulk} \end{pmatrix} \times \begin{pmatrix} \textit{Percent} \\ \textit{constituent} \\ \textit{in material} \end{pmatrix} \quad (2)$$

The constituents of production materials can change at any time and be replaced with non-VOC or non-HAP constituents, or with more volatile constituents. Some of the production processes are abated with pollution-control devices, while others are not. To account for these controls, the specific constituents must be identified. Even if the material constituents do change, however, the mass-balance method can account for the changes and reflect any impact on emissions. However, not all materials used in a process necessarily have emissions to the air.

Liquid waste shipped off site

Liquid organic waste materials are piped from tools to holding tanks to await shipment. MTI deals with nonhazardous and hazardous liquid waste streams. Under the state hazardous-waste regulations, which incorporate the federal Resource Conservation and Recovery Act (RCRA) regulations, MTI is considered a large quantity generator, as opposed to a treatment storage and disposal facility (TSDF). As a large quantity generator, MTI is required by law to remove from the premises any hazardous waste generated at the Facility within 90 days of generating the waste. Prior to shipment, waste profiles are reviewed and updated for accuracy based on process knowledge and any sampling that may have occurred. When necessary, the tank contents are transferred to a tanker truck for shipment to a licensed TSDF for final disposition. The quantity of hazardous waste transferred to the tanker truck must also be recorded on a manifest as a matter of law. The quantity of nonhazardous waste is also tracked. The results of the waste analysis and the manifest records can be used to determine the quantity of VOC or HAP constituents in the liquid organic wastes.

$$\begin{pmatrix} \textit{Constituent quantity} \\ \textit{in liquid} \\ \textit{organic waste} \end{pmatrix} = \begin{pmatrix} \textit{Percent} \\ \textit{constituent in} \\ \textit{waste analysis} \end{pmatrix} \times \begin{pmatrix} \textit{Liquid waste} \\ \textit{quantity} \\ \textit{shipped} \end{pmatrix} \tag{3}$$

Solid waste

Not all material uses are receptive to this mass-balance, method, however. Examples include the general-production cleans that take place on a daily basis throughout the Facility. These cleans and other similar support operations may use VOC- or HAP-containing materials that when discarded may not be processed through the hazardous waste systems. Some may be processed as hazardous waste but are in a solid form (e.g., rags, gloves, etc.). Others may not qualify as hazardous waste and may be disposed of as common trash. The quantity of solid waste can be tracked. However, the critical component of solid-waste streams for emission calculation purposes is the percent composition of volatile constituents. This data is more difficult to obtain from wastes in solid form. As a result, any manufacturing or support functions that cannot be specifically tied to a liquid hazardous waste stream will have emissions based entirely on usage. All VOC- or HAP-containing materials used in these particular processes will be assumed to be emitted. This is a conservative method, since no credit is taken for the quantity of volatile constituents that may be present in any solid waste shipped offsite.

Air pollution control equipment

The final element in the mass-balance calculation involves the credit for air pollution control equipment. The quantity of materials used in processes that are vented to air pollution control devices is tallied separately from the quantity of materials used in uncontrolled processes. The remaining fraction available to be emitted from controlled processes is reduced by the efficiency of the appropriate control device. Any remaining VOC or HAP constituents represent the air emissions from the Facility. Section 4.2 addresses proposed enforceable conditions for air pollution control equipment.

3.1.2 PM Emissions

The primary source of PM emissions from manufacturing is gas to particle conversion. As discussed below, this may occur after oxidation of gases in control devices or as materials evaporated from heated liquid materials condense. The majority of the manufacturing PM emissions are exhausted through scrubbers. MTI applies a number of conservative assumptions when calculating PM emissions from the manufacturing process.

PM formed by oxidation of gases

There are two primary oxidation processes that form particulate matter at MTI: 1) the oxidation of process gases in VOC abatement devices and 2) the oxidation of pyrophoric gases in safety equipment. MTI calculates PM emissions from the VOC abatement devices based on standard AP-42 emission factors for natural gas combustion because natural gas is used for pilot lights. The resulting emission rates are very low.

Pyrophoric gases are those that ignite spontaneously when exposed to air. Because silane is a pyrophoric gas, manufacturing processes using silane must be connected to a safety device that oxidizes excess silane in a controlled environment. The safety device manufacturer estimates that 99.99% of the silane will be converted to silicon dioxide, a particle. Other particulate forming gases will have similar conversion efficiencies in the oxidizer and are listed in Appendix C. Using silane as an example, the following indicates that for every mole of silane gas, 1.9 moles of silicon dioxide will be formed. The equation also assumes that MTI's wet scrubbers control 90 percent of the resulting silicon dioxide particulate matter.[2]

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[2] The wet scrubbers are already required by IDAPA 58.01.01.220 – 222, but are not "applicable requirements" within the meaning IDAPA 58.01.01.300. One of the purposes of this permit application is to incorporate scrubber operating conditions in the Tier I permit.

$$\left(\frac{1182lb}{yr}-\frac{118.2lb}{yr}\right)\times 99.99\%\times 1.9\times(1-0.9)=202.1lb/yr \tag{4}$$

$$(Usage-returned)\times conversion\times stoichiometry\times controlefficiency=total$$

Evaporation and condensation of liquid materials

In the wet process area, hydrofluoric acid (HF) and hydrochloric acid (HCl), among other chemicals, are used in liquid form in baths. During processing of wafers, some of the chemical bath will be depleted as wafers are removed from the chemical bath and placed in a rinse bath. After certain time intervals, baths need to be "topped off" due to loss of chemicals from drag out and evaporation. MTI conservatively assumes that the amount of chemical needed to top off baths is due entirely to evaporation.

MTI conservatively assumes that 10% of the total usage of liquid chemicals evaporates and is emitted from wet baths such as HF baths and HCl baths. The wet process baths are connected to acid gas scrubbers that provide control efficiencies as listed in Appendix D. An example calculation of HCl emissions from Fab 1B Wet Process is shown in equation 5.

$$\frac{2506lb}{yr}\times 10\%\times(1-0.95)=12.53lb/yr \tag{5}$$

Usage × Evaporation rate × (1 – Control Efficiency) = Total Emissions

As discussed above, emissions are derived from chemical usage. Chemical usage records are tracked by department. Each building and each stack is associated with a department, and factors are used to distribute department emissions to each stack. The modeling analysis that has been completed for this application is based on stack locations and calculated emission rates for each stack and each department.

MTI consistently applies a number of conservative methodologies when calculating particulate matter emissions from the following gaseous and liquid materials:

- Gases such as silane, diborane, phosphine, and tungsten hexafluoride may be delivered to the process tools in cylinders or through a bulk distribution system. If distribution occurs via cylinders, the cylinders are changed out and returned to the vendor before they are completely empty to avoid contamination and process interruption. MTI subtracts the amount of gas returned to the vendor from the emissions calculations.

Using silane as an example, Equation 4 (above) subtracts the amount of gas returned to the vendor from the total amount used in the process.

- Particulate matter emission calculations are based on total gas usage and do not account for any of the chemical consumed in the process.

- MTI has found that particulate matter formed in the process deposits in the ductwork leading to the scrubbers, but MTI still assumes this particulate matter is emitted.

- Emission calculations for HF and HCl include HF used, HCl used, and HF and HCl formed from the use of other chemicals such as trans-1,2 dichloroethylene and boron trifluoride. Several of these compounds are probably not emitted as particulate matter as defined in IDAPA 58.01.01.006.66, but MTI makes the conservative assumption that they are emitted as particulate matter. If HF and HCl are used in the gaseous form, they are distributed by cylinders and, similar to the silane example above, a small amount will remain in the cylinder when it is sent back to the vendor.

3.2 BOILERS

Small boilers with rated (nameplate) heat inputs ranging from approximately 1 to 30 million British thermal units per hour (MMBtu/hr) provide steam to heat the Facility as well as to humidify portions of the manufacturing process. In reality, these boilers are physically limited by ambient conditions such that they can not run at their rated capacity for an entire year. The boilers may operate at rated capacity for short periods of time during periods of extreme cold. Nonetheless, hypothetical annual emissions based on continuous operation at the boilers' nameplate capacity are presented in Appendix E.

Seven of the boilers are located in building 4 while 9 boilers are located in building 25. Boilers in building 80 and building 32 are very small (< 10 MMBtu/hr).

All the boilers are fired by natural gas, and are operated in a staging process in order to provide a continuous supply of steam for a fluctuating demand. Pressure sensors are used to fire or idle boilers as needed to maintain 50 pounds of steam in the system. The boilers are configured such that the lower capacity boilers operate at low steam demand and the higher capacity boilers operate during periods of high steam demand. Steam used to provide heat to manufacturing processes does not come in contact with the processes.

MTI calculates boiler NOx and CO emissions using manufacturer data and other pollutant emissions using EPA's "Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources," also known as AP-42.[3] Boiler operations depend on demand for heat and therefore fluctuate throughout the year. Natural gas usage for boilers in buildings 4 and 25 is monitored and recorded by individual meters on each boiler. Recorded natural gas usage rates are used to calculate actual emissions. Example calculations for actual PM10 and NO_x emissions from boiler 1 in building 4 are shown in Equations 6 and 7.

$$PM\,10 : \frac{4.608\,E+07\,ft^3}{yr} \,x\, \frac{7.6\,E-06\,lb}{ft^3} = \frac{350.2\,lb}{yr} \tag{6}$$

Natural gas usage × AP-42 emission factor = total emissions

$$NOx : \frac{4.608\,E+7\,ft^3}{yr} \,x\, \frac{7.2\,E-02\,lb}{1\,E+6\,Btu} \times \frac{1050\,Btu}{ft^3} = \frac{3483.6\,lb}{yr} \tag{7}$$

Natural gas usage × emission factor × natural gas heat content = total emissions

MTI's Tier I permit, issued December 24, 2002, addresses applicable requirements for natural gas-fired boilers. As further discussed in Chapters 4 and 5, however, MTI may add five new 30 MMBtu/hr boilers and six new 2 MMBtu/hr boilers, and is requesting limits on annual emissions of NOx and CO from the boilers (as a group) to maintain the group's minor source status.

3.3 EMERGENCY EQUIPMENT

MTI currently maintains seventeen emergency diesel generators and one diesel fire-water pump for use in sudden and unforeseeable events. These units have rated capacities ranging from 100 to 1850 horsepower. This equipment usually burns #2 diesel fuel oil, but #1 diesel can be used during cold weather to prevent the fuel from gelling. To maximize efficiency and for optimum operation, the emergency generators are heated year-round. Both the internal cab where the engine and generator are located and the water/glycol loop that circulates in the engine are heated. This allows the engine to warm up very quickly and reduces visible emissions during cold starts.

Pollutant emissions are normally limited to periods when the emergency equipment is tested and maintained. Stationary internal combustion engines used exclusively for emergency purposes, operated fewer than 200 hours per year, installed prior to April 11, 2006, and fueled by diesel are exempt from the requirement to obtain a permit to construct (IDAPA

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[3] See Appendix F for manufacturer emission rate information.

58.01.01.222.01.d). IDAPA 58.01.01.222.01.d was modified from 200 hr/yr to 500 hr/yr, effective April 11, 2006. Hypothetical annual emissions based on operation for 200 hours per year are presented in Appendix E.[4]

When available, manufacturer-supplied information is used to calculate emissions (Appendix F). When manufacturer's data are not available, two sections from AP-42 are used to calculate emissions from the emergency equipment: *Section 3.3, Gasoline and Diesel Industrial Engines* for generators rated less than 600 hp, and *Section 3.4, Large Stationary Diesel and All Stationary Duel Fuel Engines* for generators larger than 600 hp. The 17 generator engines have meters that record hours of operation, and recorded hours from these meters are used to calculate actual emissions. Hypothetical emissions from existing generators were calculated based on operating 200 hours per year. The firewater pump does not have a meter but is operated for ½ hour each month for a maintenance check. The actual emissions calculations for the firewater pump conservatively assume one hour of operation per month. Equation 8 shows an example calculation for nitrogen oxide (NO_x) emissions from a 1443 horsepower generator (11 g/hp-hr factor from AP-42, Section 3.4). There is no air pollution control equipment on the emergency equipment.

$$\frac{11g}{hp-hr} \times 1443hp \times \frac{lb}{453.6g} \times \frac{200hr}{yr} \times \frac{ton}{2000lb} = \frac{0.23ton}{yr} \qquad (8)$$

Emission factor × horse power × metric conversion × hours per year × weight conversion = total emissions

As explained in Chapters 4 and 5, MTI may add nine additional diesel generators.

3.4 MISCELLANEOUS SOURCES

Miscellaneous emission sources include wastewater treatment processes, cooling towers, tanks, fugitive dust, and other minor natural gas combustion sources. The other minor natural gas combustion sources include the VOC thermal oxidizers and process safety equipment used for destroying pyrophoric gases.

3.4.1 Wastewater Treatment Plant

The wastewater treatment plant processes multiple industrial wastewater streams in an effort to recycle, recover, or treat the wastewater. Standard treatment methods include neutralization, precipitation, settling, filtration, reverse osmosis, ion exchange, and degassification. These methods may be used alone or in any number of combinations depending on the characteristics

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[4] All diesel-fueled emergency generators installed to date have been exempt from the requirement to obtain a PTC because they have been operated fewer than 200 hours per year.

of the wastewater being treated. Particulate matter emissions from wastewater treatment operations (e.g., hydrochloric acid) are included in the modeling as volume sources.

3.4.2 Cooling Towers

Cooling towers are used at MTI to dissipate heat from non-contact cooling water. An on-demand system similar to the boilers is used with the cooling towers to accommodate fluctuating demand for cooling. Cooling demand will dictate when the different cells within a cooling tower configuration are utilized. No chromium-based water treatment chemicals are used in the circulating water of any of the cooling towers at MTI.

Emission rates have been calculated for the nine cooling towers cells associated with Building 4, the eight associated with Building 25, and five associated with two nitrogen plants on site. These sources have also been included in the modeling simulations. Emissions from cooling towers are based on the drift loss, amount of total dissolved solids (TDS) in the circulating water, water flow rate, and hours of operation. Particulate matter is the only emission relevant to cooling towers and results from dissolved solids in the water carried with drift. Drift loss is the percent of water entrained in the air exhausted from the cooling tower and varies by manufacturer. Emissions are therefore calculated on a manufacturer basis and not on a per tower basis.

Cooling towers from three different manufacturers are currently used at MTI – Marley, Psychrometric Systems, Inc. (PSI), and Ceramic Cooling Tower Corporation (CCT). Drift loss from Marley cooling towers is 0.02% while drift loss for PSI towers is 0.008%, and from CCT towers is 0.005%. Water currently circulated through the cooling towers is maintained with a maximum total dissolved solids (TDS) concentration of 750 ppm. Total maximum flow rate of water circulation through the cooling towers is 10,400 gallons per minute (gpm), 70,000 gpm and 15,000 gpm for the Marley, PSI and CCT towers respectively. Cooling tower operations depend on cooling demand and may, therefore, fluctuate throughout the year. MTI does not currently monitor water circulation rate at each tower. Therefore, cooling tower emissions are based on maximum operation of all towers for 8,760 hours per year. An example calculation of particulate emissions from the CCT towers is shown below in Equation 9.

$$\frac{15{,}000gal}{\min} x \frac{60\min}{hr} x \frac{8{,}760hr}{yr} x \frac{8.34lb}{gal} x \frac{1ton}{2000lb} = \frac{3.50tons}{yr} \qquad (9)$$

H_2O flow rate × time conversions × density of H_2O × weight conv × TDS conc × drift loss = total emissions

3.4.3 Tanks

Tanks are maintained on-site for the storage and distribution of diesel and gasoline fuels and temporary storage of hazardous waste. Some tanks are used to provide fuel for transportation, delivery, support, and miscellaneous vehicles. In addition, emergency generators and the firewater pump have dedicated fuel storage tanks. These tanks emit negligible quantities of VOCs. The Standards of Performance for Volatile Organic Liquid (VOL) Storage Vessels (including petroleum liquid storage vessels), 40 CFR 60 Subpart Kb, was modified (68 FR 59332, Oct. 15, 2003) to only affect tanks with capacities greater than or equal to 75 m^3. There are no VOL tanks that equal or exceed 75 m^3 at MTI. Therefore, MTI is no longer subject to the requirements at Subpart Kb.

3.4.4 Paved and Unpaved Road Fugitive Emissions

MTI has an interest in keeping the Facility as clean as possible. Dust is detrimental to semiconductor manufacturing and MTI operates in a fashion that minimizes particulate matter generation. In an effort to limit particulate matter generated from outdoor sources, MTI has paved all major traffic areas. All requirements under state and federal law applicable to fugitive emissions are already contained in the Tier I permit.

Section 5.3 of the State of Idaho Air Quality Modeling Guideline indicates fugitive emissions need not be included in the permit application, provided the emissions are not counted for applicability purposes and any required fugitive-dust-control plan or its equivalent is submitted. MTI is not required to count fugitive dust emissions for applicability purposes. The Tier I permit contains the fugitive dust control requirements. Fugitive emissions rates from vehicle traffic are not required to be included with this Tier II permit application.

4.0 PROPOSED TIER II CONDITIONS

As previously noted, the purposes of this revised application are to:

- Update the emission inventory,
- Refine proposed Facility emission caps (FECs),
- Propose permit terms
- Authorize potential minor modifications to the Facility, including potential construction of additional manufacturing capacity, that may increase emissions under the proposed FEC,
- Incorporate terms of the Third Amended Consent Order into a Tier II permit, and
- Develop an alternative tracking system for substances listed at IDAPA 58.01.01.585 and 586.

MTI seeks to obtain the flexibility to construct minor modifications and to operate the Facility within the FEC limitations subject to a mutually agreeable compliance demonstration method.

In this chapter, the expanded FEC request is detailed and related Tier II permit conditions are proposed.

4.1 FACILITY EMISSION CAP

MTI proposes to establish FECs for criteria air pollutants in order to avoid frequent and repetitive evaluations of routine process changes at the Facility. MTI proposes that the FECs will constitute preconstruction approval and will allow flexibility to reconfigure and install new fabrication tools, related pollution control equipment, eleven new boilers, and nine emergency generators without performing individual applicability determinations for each project. Specific Proposed Conditions, including emission limits, are set forth in Section 4.2.3.

The FEC rule describes three potential components of a FEC: 1) baseline actual emissions, 2) an operational variability component and 3) an optional growth component.

4.1.1 Baseline Actual Emissions

Combustion emissions result from operation of natural gas-fired boilers, diesel-fueled emergency generators, VOC abatement devices, and process safety equipment. The diesel generators are routinely operated for testing and maintenance (typically about 12 hours per year per generator). All boilers are used, but due to operational constraints, the average annual utilization is only 36% of capacity. The VOC abatement units and process safety equipment are small sources of combustion emissions because the gas firing rates are very low.

As discussed in Chapters 2 and 3, the manufacturing process emits particulate matter and VOCs. In addition, small quantities of particulate matter are emitted by fugitive process sources and cooling towers.

The 2003/2004 average Facility-wide baseline actual emissions of criteria pollutants are summarized in Table 4-1. Details of the baseline actual emission calculations are provided in Appendix G.

4.1.2 Operational Variability Component

As defined in the FEC rule, the allowance for operational variability may be up to the significant emission rate minus one ton per year. If the significant emission rate is less than ten tons per year, then DEQ and the applicant must negotiate the operational variability component of the FEC.

MTI has chosen not to request the maximum operational variability for carbon monoxide, sulfur dioxide, or volatile organic compounds. Nonetheless, MTI has allowed for increased operation of combustion devices beyond the very low historic usage rates. MTI proposes a FEC on lead emission of 120 pounds per year, which is 10 percent of the 1,200 pound per year significant emission rate for lead.

The proposed operational variability components of the FECs for relevant criteria pollutant are identified in Table 4-1. As discussed in Chapter 2, the semiconductor manufacturing operation is constantly changing, and operational variability is the norm. For example, process engineers indicate that routine recipe changes could result in a doubling of particulate matter emissions from some scrubbers. Consequently, MTI has included an allowance for change that could occur even without the change allowed for in the Growth Component that is discussed below.

4.1.3 Growth Component

The proposed rule includes a growth component when establishing a FEC "to allow for potential future business growth or Facility changes that may increase emissions." In fact, one of the purposes of this application is to authorize potential modifications to the Facility, including construction of additional manufacturing capacity, which may increase emissions.

Through this combined PTC and Tier II permit application, MTI proposes to allow for the installation of eleven additional boilers and nine additional diesel generators. In addition, MTI proposes to allow for additional manufacturing capacity and for changes in process technology and chemistry by establishing emission limits that are higher than existing actual emissions.

In addition to identifying current actual emissions, Table 4-1 identifies anticipated emission increases attributable to installation of additional boilers and generators and to changes in the manufacturing process. Using the parlance of the FEC rule, these emissions comprise the "Growth Component" of the FEC because they represent emission changes at the Facility that are anticipated to occur over the course of the permit term.

NOx and CO emissions attributable to the new boilers were based on vendor emission factors for existing 30-MMBtu/hr boilers; SO2, VOC, and PM10 emissions are based on AP-42 emission factors. Annual emissions from the new boilers are based on the following assumptions:

- 162 MMBtu/hr gas consumption (5 boilers at 30 MMBtu/hr each and 6 boilers at 2 MMBtu/hr)

- Each boiler operates 11 months per year at the same capacity as existing boilers now operate (36%) and one month at its maximum operating rate (to allow for unusually cold weather).

Emission factors for diesel generators were based on manufacturer's data for one of the newer generators at the site: 24D-GEN-02. Annual emissions for the new generators were based on all nine generators operating 100 hours per year. Actual generator hours will be monitored. Details of the growth component emission calculations are provided in Appendix G.

The growth component of the PM10 and VOC FECs must also allow for new manufacturing equipment. The manufacturing emissions were estimated by assuming the new manufacturing units would have emission rates comparable to existing manufacturing emissions. This assumption resulted in (annual) growth component emissions of 38 tons VOC and 9.7 tons PM10 from the new Fab, and 17 tons VOC and 0.7 tons PM10 from the proposed new mask shop. This could occur as a result of new production capacity or retooling, such as the possible development of capacity to process 300 mm wafers. Considering combustion sources and manufacturing sources, MTI proposes growth components of 55 T/yr for VOC and 11 T/yr for PM10.

4.1.4 Proposed Facility Emission Cap

Table 4-1 summarizes the baseline emissions, MTI's proposed growth and operational variability components, and a proposed FEC for each criteria pollutant from all sources at the Facility. Details of the calculation of Baseline Emissions and the Growth Component are provided in Appendix G. Proposed conditions presented in Section 4.2 consider appropriate record-keeping and reporting requirements to ensure compliance with the FECs.

TABLE 4-1

CRITERIA AND HAZARDOUS POLLUTANT BASELINE EMISSIONS AND PROPOSED FEC

	NOx (T/yr)	CO (T/yr)	SO2 (T/yr)	VOC (T/yr)	PM10 (T/yr)	Pb (T/yr)	Single HAP	All HAP
Baseline Actual Emissions	39	36	1	98	33	<0.02	5	15
Operational Variability Component	39	37	1	23	14	0.02	NA	NA
Proposed Growth Component	48	31	5	55	11	0.02	<5	<10
Total Proposed FEC	126	104	7	176	59	0.06	<10	<25
Emissions rounded up to the nearest whole ton per year, except Pb.								

4.1.5 Demonstration of Pre-construction compliance with IDAPA 58.01.01.210

In support of MTI's request for pre-authorization of future Facility changes and to reduce the record-keeping burden, MTI has addressed the considerations underlying IDAPA 58.01.01.210. IDAPA 58.01.01.210.04 allows a source to demonstrate preconstruction compliance with Section 210 through any of the standard methods in IDAPA 58.01.01.210.05 through 210.08.

MTI has addressed compliance with Section 210 in two steps. First, MTI addressed emissions from the five 30 MMBtu/hr and six 2 MMBtu/hr boilers proposed with the Growth Component by assuming all boilers were installed at the same time. Section 5.5.1 and Table 5-6 indicates emissions of most substances listed in IDAPA 58.01.01.585 and 586 from the boilers (combined) would be less than the ELs. For the few substances emitted in excess of the ELs, predicted concentrations resulting from the uncontrolled emissions would be less than the corresponding AACs or AACCs. Consequently, the proposed boiler emissions would satisfy 58.01.01.210 using the options prescribed in Sections 210.05 and 210.06.

Secondly, MTI addressed compliance with Section 210 for future process emissions based on IDAPA 58.01.01.210.05 and 210.08, which allows a comparison of ambient concentrations predicted using controlled emissions to the applicable acceptable ambient concentration listed at IDAPA 58.01.01.585 or 586. The following paragraphs describe the analysis that MTI conducted.

MTI assessed compliance with Section 210 by considering projected Facility-wide increases in process emissions of substances listed at IDAPA 58.01.01.585 and 586. The Facility-wide analysis is far more rigorous than required under IDAPA 58.01.01.210, which requires only that emission increase associated with individual changes be compared to the criteria at IDAPA 58.01.01.585 and 586.

MTI has implemented an extensive system for tracking raw materials used at the Facility. This system, which includes an MSDS for each raw material, enables MTI to track thousands of chemicals by CAS number and common name. Some raw materials result in emissions of air pollutants listed at IDAPA 58.01.01.585 and 586. In order to determine whether a proposed project (modification) triggers a requirement to obtain a PTC, MTI staff currently conducts applicability determinations for each proposed project. Since IDAPA 58.01.01.585 and 586 were adopted in 1994, every evaluation has confirmed that a PTC is not required because anticipated increases in these materials have resulted in emissions less than the PTC applicability triggers.

For this application, MTI first estimated actual process-generated emissions of substances listed at IDAPA 58.01.01.585 and 586 for four recent calendar years (2001-2004). Table 4-2 presents an estimate of the maximum annual emissions of such substances emitted during the four-year period, ranked by the percentage of actual annual emissions versus the corresponding EL. A complete list of substances listed at Sections 585 and 586 that MTI emits is provided in Appendix H.

For the purposes of this review, MTI assumed that emissions of substances listed at IDAPA 58.01.01.585 and 586 from manufacturing sources would increase in proportion to VOC emissions. As indicted in Table 4-1, the proposed VOC FEC would allow for an increase of 55 tons with the Growth Component and 23 tons through the Operational Variability Component. Discounting the small VOC contribution from boilers and generators in these components, the proposed FEC would provide an approximate 80 percent increase in VOC emissions from manufacturing processes.

For this analysis, therefore, MTI assumed manufacturing process emissions of substances listed at IDAPA 58.01.01.585 and 586 would increase approximately 80 percent. Table 4-2 compares proposed Facility-wide increases in emissions of substances listed at IDAPA

58.01.01.585 and 586 (based on 80 percent of existing process emissions) to the ELs identified in Sections 585 and 586. At this rate, almost all of the substances listed in Sections 585 and 586 would be emitted (Facility-wide) in quantities well below the ELs that apply to a single modification. Consequently, this increase in Facility-wide emissions of most of these substances could take place and the incremental increase would not exceed the ELs. However, estimated emissions of 18 substances would be expected to exceed the EL. If an increase greater than an EL were attributable to a modification requiring a PTC, one would demonstrate compliance with criteria listed at IDAPA 58.01.01.585 and 586 with a modeling analysis to ensure that predicted concentrations are less than Acceptable Ambient Concentrations (AACs) and Acceptable Ambient Concentrations for Carcinogens (AACCs).

TABLE 4-2

Facility-Wide Increases[5] of emissions of Substances Listed at IDAPA 58.01.01.585 and 586

Material	80% of Current Consumption (lb/yr)	Emission Rate (lb/hr)	IDAPA EL (lb/hr)	Percent of EL	Max Predicted Impact (µg/m³)	IDAPA AAC/AACC (µg/m³)	Over AAC/ AACC ?	Percent of AAC/ AACC
Silica – Quartz	2688	0.31	0.0067	4580	4.01	5	No	80
Silica Amorphous (Fused)	1706	0.19	0.0067	2907	2.54	5	No	51
Hydrochloric Acid	6316	0.72	0.05	1442	9.42	375	No	3
Ammonia	114430	13.06	1.2	1089	170.63	900	No	19
Potassium Hydroxide	8017	0.92	0.133	688	11.95	100	No	12
Methylene Bisphenyl Isocyanate	150	0.02	0.003	569	0.22	2.5	No	9
Hydrofluoric Acid (Fluorides)	8032	0.92	0.167	549	12.0	125	No	10
Chlorine	5487	0.63	0.2	313	8.2	150	No	5
1,2-Ethanediamine, N-(2-Aminoethyl)-	6909	0.79	0.267	295	10.30	200	No	5
Formaldehyde	13	1.5E-03	0.00051	288	0.005	0.077	No	7
Hydrogen Peroxide	2480	0.28	0.1	283	3.70	75	No	5
Sodium Metabisulfite	7800	0.89	0.333	267	11.63	250	No	5
Sodium Hydroxide	2435	0.28	0.133	209	3.63	100	No	4
Methylene Chloride	28	3.2E-03	0.0016	203	0.01	0.24	No	5
Crystalline Silica, Cristobalite	55	6.3E-03	0.0033	192	0.083	2.5	No	3
Chloroform	4	4.8E-04	0.00028	172	0.00	0.043	No	4
Sulfuric Acid	845	0.10	0.067	144	1.26	50	No	3
Hydrogen Bromide	754	0.09	0.0667	129	1.12	500	No	0.2

[5] Based upon the VOC FEC, MTI assumed manufacturing process emissions of substances listed at IDAPA 58.01.01.585 and 586 would increase approximately 80 percent.

Following that rationale for those substances with anticipated emission increases exceeding their EL, MTI conducted a very conservative modeling analysis that demonstrates the increases would not result in ambient concentrations exceeding the AAC or AACC for any of the pollutants listed at IDAPA 58.01.01.585 or 586. That analysis is discussed in Section 5.5. Predicted concentrations for those substances with emissions exceeding the ELs are also displayed in Table 4.2. All predicted concentrations are less than the AACs and the AACCs. In summary, the forgoing analysis demonstrates that increases in emissions of substances listed at IDAPA 58.01.01.585 and 586 currently emitted Facility-wide in proportion to VOC increases requested under the FEC would be less than the ELs for most substances and would be less than the AACs and AACCs for all substances. This is an extremely conservative approach to addressing consistency with IDAPA 58.01.01.585 and 586, which applies to the incremental increase in emissions from a single project rather than an entire facility.

Based upon these considerations, MTI proposes that an alternative record keeping system be incorporated into the Tier II permit in order to reduce the administrative burden of project-by-project calculations. MTI proposes to monitor monthly materials usage (as it does today) and calculate emissions of substances listed at IDAPA 58.01.01.585 and 586. MTI will divide monthly emissions by the number of hours in the month and subtract the current hourly emissions identified in Table 4-2. If a substance listed at IDAPA 58.01.01.585 or 586 is emitted and does not have an established baseline emissions rate, monthly emissions will be evaluated the same as chemicals with a baseline, however, the baseline emissions rate will be zero for that substance. The proposed monitoring will account for all pollutants listed in IDAPA 58.01.01.585-586, even those pollutants for which there is no established baseline. Therefore, upon issuance, this permit will authorize emissions of any substance listed in IDAPA 58.01.01.585-586. After permit issuance, there will no longer be a need to conduct applicability determinations under IDAPA 58.01.01.223 for substances listed in IDAPA 58.01.01.585-586.

The dispersion modeling described in Chapter 5 identified dispersion characteristics for emissions from worst-case stacks (Chi/Q).[6,7] This modeling can be used to determine the

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[6] For modeling purposes MTI assumed combustion emissions are all emitted from the worst case boiler stack and all process emissions are emitted from the worst-case wet scrubber stack. Based on the modeling analysis in Chapter 5, MTI will apply Chi/Q values of 13.06 and 3.51 for 24-hour and annual emissions, respectively. These Chi/Q values represent dispersion from the worst-case scrubber stack.

[7] Dispersion modeling reveals a concentration (denoted by the Greek letter chi) based on an emission rate (denoted Q). Modelers often apply the ratio of the predicted concentration (chi) by a unit emission rate (e.g., 1 pound per hour, denoted Q) to estimate concentrations of other pollutants for the same averaging time (e.g., 24-hours).

"*threshold*" emission rate for each substance listed at IDAPA 58.01.01.585 or 586 that would produce ambient concentrations just equal to that substance's AACs or AACCs if it were emitted from the worst case stack. Consistent with MTI's current methodology for addressing substances listed at IDAPA 58.01.01.585 and 586, MTI will assess compliance with IDAPA 58.01.01.210 by comparing emission increases against those *threshold* emission rates. If the emission increase exceeds the *threshold* emission rate for a substance listed at IDAPA 58.01.01.585 or 586, MTI will conduct a refined modeling analysis to demonstrate compliance with IDAPA 58.01.01.210. This approach would free MTI staff from the numerous applicability determinations as long as the emission tracking system confirms that Facility-wide monthly average hourly emissions are below the *threshold* emission rates.

MTI acknowledges that this approach only provides an "after-the-fact" assessment of compliance with IDAPA 58.01.01.210. However, this review will still ensure compliance with appropriate criteria because

1) The modeling approach described in Chapter 5 is extremely conservative, and a more realistic assessment will reveal a significantly greater margin of compliance than identified by the Chi/Q technique and by Table 4-2; and

2) The use of Facility-wide monthly emission increases for comparison to AAC/AACC criteria is far more stringent than the project-by-project approach required by law.

Proposed conditions related to compliance with IDAPA 58.01.01.210 are identified in Section 5.2.3.

4.1.6 Major Source Status – Hazardous Air Pollutants (HAPS)

40 CFR Part 63, Subpart BBBBB establishes National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Semiconductor Manufacturing. A semiconductor facility is subject to this NESHAP if the facility is a major source of hazardous air pollutants emissions (HAPs), considering controls. Per 40 CFR Part 63.7181 (b), "a major source of HAP emissions is any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit, considering controls, in the aggregate, any single HAP at a rate of 10 tons per year (T/yr) or more or any combination of HAP at a rate of 25 T/yr or more."

Table 4-3 identifies Facility HAP emissions for the period 2001-2004. Table 4-3 indicates the Facility is not a major source of HAPs considering controls required by IDAPA 58.01.01.220-223; therefore this NESHAP is not applicable to the Facility at this time.

MTI intends to rely on the devices (i.e. wet scrubbers and oxidizers) used for HAP emissions control to limit the HAP potential to emit. Proposed permit conditions for this control equipment are contained in Section 4.2.1 and 4.2.2 of this application. MTI proposes to limit HAP emissions to less than 10 T/yr for any single HAP and less than 25 T/yr for the aggregate of all HAPs.

TABLE 4-3: HAP EMISSIONS SUMMARY, 2001-2004

Year	Facility-wide HAP Emissions (Tons/yr)	HAP Emitted in Greatest Quantity	Greatest Individual HAP Emission (Tons/yr)
2001	12.3	Hydrofluoric Acid	4.0
2002	13.3	Hydrochloric Acid	4.0
2003	12.2	Hydrofluoric Acid	5.1
2004	17.5	2-(2-Butoxyethoxy)Ethanol	4.6

4.2 SPECIFIC PROPOSED CONDITIONS

This section identifies appropriate permit conditions relevant to operation of emission control devices and to the proposed FECs. MTI proposes that DEQ incorporate these conditions into the Facility's PTC/Tier II operating permit.

4.2.1 Wet Scrubber Permit Conditions

Wet scrubbers are used throughout the Facility to control emissions of acids, bases, and water-soluble constituents that are predominantly emitted from the process cleaning steps but also from the etch steps. The generic design of wet scrubbers entails the use of an aqueous solution flowing through a packed chamber to remove pollutants in the gas stream. The contacting liquid is sprayed over the chamber packing, which is configured to provide more efficient mass transfer of the flue gas components by maximizing the surface area of the contacting liquid. Wet scrubbers can be in either a vertical or horizontal configuration. Horizontal scrubbers use a liquid/gas crossflow where the gas enters the side of the scrubber and the contacting liquid flows down from the top. Vertical scrubbers use a liquid/gas counterflow in which the gas flows upward through the contacting liquid. In both cases, the flue gas exits the scrubber while the contacting liquid flows to the bottom of the scrubber where it is collected for recirculation or treatment.

Most of the scrubbers used at the Facility are horizontal scrubbers. All recirculating contact liquid is water with a controlled pH. Water flow rate, pH and media packing depth are directly related to efficiency. Instruments to measure liquid flow rate and pH are installed and maintained for each scrubber.

Each scrubber system is designed for a specific application. Each scrubber operates at optimum efficiency with slightly different parameters than those that may apply to another scrubber located elsewhere on site. Wet scrubber design efficiencies are based on manufacturer recommendations provided in Appendix D. The removal efficiencies depend on the depth of packing material in each scrubber. More packing helps create a larger surface area for the flue gas-contacting liquid transfer, which corresponds to higher removal efficiencies. The depth of packing in wet scrubbers at MTI varies from three to five feet but in no case is there a scrubber that has less than two feet of packing. As a conservative measure, the removal efficiencies for two feet of packing depth are credited in the emission calculations. Removal efficiencies for wet scrubbers are also discussed in Appendix D.

The Technical Basis for the Tier I permit issued by DEQ December 24, 2002 states in section 5.2.12 that "A Tier II operating permit will allow the Facility to consider the wet scrubbers in calculating potential to emit. The Tier II operating permit shall establish specific emission standards, or shall establish requirements on operation or maintenance that are necessary to ensure compliance with any applicable emission standard or rule." Although these wet scrubbers are already required by Rule, one of the primary purposes of this permit application is to further document use of the wet scrubbers by establishing specific permit conditions.

MTI renews its past proposal for permit conditions on wet scrubbers to control emissions from certain sources at the Facility. As already noted, DEQ proposed scrubber conditions in the draft Tier I permit released for public comment on November 10, 1999. MTI again asserts that monitoring pressure drop is not an effective means to ensure proper operation of these emissions control units and permit conditions should not include monitoring of pressure drop.

As an alternative to an operations and maintenance manual for each wet scrubber MTI proposes to develop a log containing the minimum water recirculation flow rate required to maintain proper performance for each of the wet scrubbers. This log will be continually updated as new scrubbers are added or existing scrubbers are modified. This log will be maintained on-site and made available to DEQ representatives upon request.

Specifically, MTI proposes operating, monitoring, and record-keeping permit conditions for the wet scrubbers as follows:

Operating Conditions

1) MTI shall properly operate and maintain the wet scrubbers. Proper operation and maintenance includes downtime for repairs and maintenance.

2) The minimum water recirculation rate of the wet scrubbers shall be maintained. MTI shall install and operate instruments to monitor the scrubbing water recirculation rate. Within 90 days of permit issuance MTI shall develop a log that contains the minimum scrubbing water recirculation flow rate required to maintain proper performance for each wet scrubber. If an existing scrubber is modified or a new scrubber is installed the log shall be updated to reflect the minimum recirculation flow rate for the new or modified scrubber. The log shall be maintained on-site and made available to DEQ representatives upon request.

3) The scrubbing water pH shall be properly maintained. MTI shall install and operate instruments to continuously monitor and adjust the pH of the scrubbing water. Additionally, MTI shall continuously monitor the operational status of the scrubbing water recirculation pump.

4) MTI shall take corrective action as expeditiously as practicable whenever there is scrubber downtime or malfunction. Deviations from Permit Conditions 1, 2 or 3, when corrected within a reasonable time, shall not constitute a violation.

Monitoring and Recordkeeping

5) Emissions estimates from scrubbers used to demonstrate compliance with Permit Conditions 15, 20 and 22 shall assume no control during the time periods when a scrubber is down and there is no redundant backup.

6) Once per day MTI shall record the scrubbing water pH for each operating scrubber. Once per month MTI shall record the scrubbing water flow rate for each operating scrubber.

4.2.2 VOC Abatement Devices Permit Conditions

MTI's current Tier I operating permit includes a number of conditions governing operation of VOC abatement devices. These conditions were established in a Third Amended Consent Order in October 2002. MTI proposes to include those conditions in the Tier II operating permit, thereby allowing the Consent Order to be terminated in accordance with paragraph 18 of the Consent Order. The relevant conditions follow.

7) For the purposes of this operating permit, certain terms are defined as follows:

- "Coat track" means a semiconductor manufacturing tool that performs a process called coat bake in the photolithography area of the Facility.
- "Coat bake" means a batch process where liquids potentially containing volatile organic compounds (VOCs) are applied to the surface of silicon wafers and then cured.
- "Facility" means the semiconductor manufacturing facility owned and operated by MTI in Boise, Idaho.
- "VOC abatement unit" means a system that gathers, concentrates, and oxidizes volatile organic compounds (VOCs).

[Third Amended Consent Order, 10/7/02]

8) MTI shall operate VOC abatement units to control emissions from coat tracks thereby limiting the Facility's potential to emit VOCs.
[IDAPA 58.01.01.322.01, 3/19/99; Third Amended Consent Order, 10/7/02]

9) MTI shall connect all coat tracks installed at the Facility to a VOC abatement unit.
[IDAPA 58.01.01.322.01, 3/19/99; Third Amended Consent Order, 10/7/02]

10) MTI shall, at all times, properly operate and maintain the VOC abatement units. Proper operation and maintenance includes downtime for repairs and maintenance.
[IDAPA 58.01.01.322.01, 3/19/99; Third Amended Consent Order, 10/7/02]

11) MTI shall operate the VOC abatement units according to manufacturers' recommendations as follows:

a) Oxidation temperature shall be 1,350 degrees F or greater.

[IDAPA 58.01.01.322.01, 3/19/99; Third Amended Consent Order, 10/7/02]

b) Desorption temperature shall be 340 degrees F or greater.

[IDAPA 58.01.01.322.01, 3/19/99; Third Amended Consent Order, 10/7/02]

c) Each unit shall not be operated outside of the manufacturer's design capacity, 1,500 to 6,700 acfm for D-1500 units or equivalent, 2,000 to 15,000 acfm for S-2400 units or equivalent, or 5,000 to 30,000 acfm for D-3500 units or equivalent as applicable.

[IDAPA 58.01.01.322.01, 3/19/99; Third Amended Consent Order, 10/7/02]

12) MTI shall continuously monitor the parameters set forth in Permit Conditions 4.5.1 and 4.5.2. Once per month, MTI shall record the parameters set forth in Permit Conditions 4.5.1, 4.5.2, and 4.5.3. This information shall be made available to the Department upon request.
[IDAPA 58.01.01.322.01, 3/19/99; Third Amended Consent Order, 10/7/02]

13) MTI shall keep records of downtime per VOC abatement unit, which shall be made available to the Department upon request.
[IDAPA 58.01.01.322.01, 3/19/99; Third Amended Consent Order, 10/7/02]

14) In conducting applicability determinations under IDAPA 58.01.01.200-223, MTI may take into account the controls required by this operating permit in calculating potential to emit. Once per month, MTI shall determine and record, based on the parameters outlined in Permit Condition 4.5, the control efficiency for each VOC abatement unit.
[IDAPA 58.01.01.322.01, 3/19/99; Third Amended Consent Order, 10/7/02]

4.2.3 Facility Emission Caps

Chapter 5 of this application describes a dispersion modeling analysis that evaluates potential ambient impacts of criteria pollutant emissions from existing boilers, emergency generators, non-contact cooling towers, and "growth" and "operational variability" emission increases associated with the proposed FECs. Even with the emissions increases resulting from the proposed FEC, predicted concentrations of criteria air pollutants will not cause or significantly contribute to a violation of any ambient air standard.

With DEQ's approval of MTI's proposed FECs, which constitute preconstruction approval of potential modifications to the Facility, MTI proposes to delete condition 4.9 of the Tier I permit and add the following conditions to the existing Tier I permit:

~~4.9 Every six months, MTI shall submit to the Department a summary report of all applicability determinations conducted by MTI under IDAPA 58.01.01.200-223 involving VOC emissions after the date of this operating permit, including status of construction. All supporting documentation shall be made available to the Department upon request.~~
~~[IDAPA 58.01.01.322.01, 3/19/99; Third Amended Consent Order, 10/7/02]~~

15) Total Facility-wide annual NOx, CO, SO2, VOC, PM10, lead, and HAP emissions shall not exceed the FEC limits in Table 4-4.

TABLE 4-4: PROPOSED FEC

NOx (T/yr)	CO (T/yr)	SO2 (T/yr)	VOC (T/yr)	PM10 (T/yr)	Pb (T/yr)	Single HAP	All HAP
126	104	7	176	59	0.06	<10	<25

[IDAPA 58.01.01.175]

16) Total NOx emissions from fossil fuel-fired boilers operated at the Facility shall not exceed 75 tons per year.

17) Total CO emissions from fossil fuel-fired boilers operated at the Facility shall not exceed 75 tons per year.

18) For combustion sources, MTI shall calculate and record rolling 12-month total criteria air pollutant emissions and HAP emissions.

[IDAPA 58.01.01.175]

19) For manufacturing process sources, MTI shall maintain records of materials used in the manufacturing process to estimate production-related emissions of PM10, VOCs, lead, and HAPs on a monthly basis.

[IDAPA 58.01.01.175]

20) For semiconductor manufacturing processes and combustion sources, MTI shall calculate and record rolling 12-month totals of each HAP known to be emitted. Monthly estimates of actual emissions shall be used to calculate rolling 12-month total emissions of each pollutant to demonstrate compliance with the annual emissions limits in Permit Condition 15. Estimates of actual emissions may account for wet scrubber and VOC abatement unit control efficiency as provided by the scrubber or VOC abatement unit manufacturer or applicable engineering data. All monitoring records and support information shall be retained for a period of five years from the date measured or recorded.

21) MTI shall report to the Department the 12-month total pollutant emissions recorded under conditions 18 and 19 annually.

[IDAPA 58.01.01.175]

22) This permit authorizes MTI to make modifications to the Facility which change emissions of pollutants listed in IDAPA 58.01.01.585 and 586. The procedures in IDAPA 58.01.01.223 are not applicable provided that MTI complies with this permit condition. MTI shall monitor material usage to calculate monthly average hourly process emissions of substances listed at IDAPA 58.01.01.585 and 586. If necessary, MTI shall conduct a refined modeling analysis for increases in emissions of any

substance listed at IDAPA 58.01.01.585 or 586 (E_i) that exceeds E_{ia} calculated by the following formulas.

a) For pollutants listed at IDAPA 58.01.01.585;

$$E_{ia} = \frac{AAC * 1000 * 0.8}{CQ_{24-hr}} \tag{10}$$

b) For pollutants listed in IDAPA 58.01.01.586:

$$E_{ia} = \frac{AACC * 0.8}{CQ_{annual}} \tag{11}$$

And E_i is calculated from the following equation;

$$E_i = \frac{E_m}{H_m} - M_u \tag{12}$$

Where;
E_{ia} = Increase in hourly emissions that triggers a refined modeling analysis (lb/hr)
E_i = Calculated increase in hourly emissions (lb/hr)
E_m = Monitored monthly emissions rate (lb/month)
H_m = Hours in the month of the calculation (hours)
0.8 = Additional margin of safety for compliance demonstration
M_u = Baseline hourly emission rate in lb/hr from Table 4-2 (lb/hr)
$CQ_{24\text{-}hr}$ = Chi/Q value for 24-hour averaging period = 13.06 ug/m3 per lb/hr
CQ_{annual} = Chi/Q value for annual averaging period = 3.51 ug/m3 per lb/hr

Following are two examples to clarify how condition 22 is intended to work:

- Ammonia is listed as a non-carcinogen with an AAC of 900 ug/m3. If the actual monthly emissions (E_m) minus the baseline hourly emissions (E_i) is greater than 55.1 lb/hr (.9*1000*.8/13.06), MTI would have to do a specific evaluation of compliance with the AAC. From Appendix H, anticipated increases in ammonia emissions are 13.06 lb/hr, so the anticipated increase would not trigger a detailed analysis.

- Formaldehyde is listed as a carcinogen with an AACC of 0.05 ug/m3. If the actual monthly emissions (E_m) minus the baseline hourly emissions (E_i) is greater than 0.011 lb/hr (0.05*.8/3.51), MTI would have to do a specific evaluation of compliance with the AACC From Table 4.2, anticipated increases in formaldeyde emissions are 0.0015 lb/hr, so the anticipated increase would not trigger a detailed analysis.

23) This permit authorizes changes to the Facility which increase emissions of criteria pollutants and HAPs and that comply with the terms and conditions of this permit and meet the requirements of IDAPA 58.01.01.181.

Finally, the submittal of a complete application in March 2003 fulfilled Tier I condition 4.10. Therefore, Condition 4.10 is obsolete should be deleted. Additionally, that application fulfilled MTI's commitment contained in Condition 16 of the Third Amended Consent Order dated October 7, 2002.

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5.0 DISPERSION MODELING

Geomatrix applied computer-based dispersion modeling techniques to simulate local dispersion of criteria air pollutant emissions from the Facility. The results of the modeling are used to show that the Facility does not cause or significantly contribute to a violation of any ambient standard as required in IDAPA 58.01.01.203.02 and 403.02. Although, not required by the Rules, Geomatrix took the extra step to apply the same modeling techniques to evaluate substances listed at IDAPA 58.01.01.585 and 586, and determined these substances do not exceed levels as specified at IDAPA 58.01.01.585 and 586.

The dispersion modeling techniques employed in the analysis follow a basic set of EPA regulatory guidelines (40 CFR Part 51, Appendix W). The techniques employed here are also consistent with DEQ guidance entitled "State of Idaho Air Quality Modeling Guidelines." The Guidelines include recommendations for model selection, data preparation, and model application. Although DEQ has not had an opportunity to review the operating scenarios added to evaluate the proposed FECs, the current analysis is consistent with the modeling protocol DEQ approved in 2003. That protocol and approval are included as Appendix I.

A site plan is included in Appendix J. A compact disk provided in Appendix K includes air quality modeling input files. Appendices L and M describe point sources and volume (fugitive) PM10 sources, respectively.

5.1 DISPERSION MODEL SELECTION AND APPLICATION

On November 9, 2005, EPA recommended replacing ISCST3 with AERMOD for dispersion analysis. 70 Fed. Reg. 68218 (Wednesday, November 9, 2005). In the meantime, the rule allows for the reviewing authority to approve the use of ISCST3 for a period of one year from the date of promulgation, November 9, 2005. MTI selected the EPA-approved ISCST3 model for the dispersion analysis at the proposed Facility. It is our understanding ISCST3 is acceptable to DEQ. The model was applied using the methodology and inputs described in the protocol, including the meteorological data, the modeling options, the receptor locations, the receptor grid, and the background concentration data.

Although the protocol was followed, DEQ identified several issues with the protocol that Geomatrix has addressed here along with other clarifications:

- The ISCST3 model does not evaluate source/receptor combinations in which the receptors are in the cavity region of a building. Initial modeling indicated that two emission sources (80-GEN-01 and 80-GEN-02) were not being evaluated at a single property line receptor as a result of a building cavity region. In order to account for this exclusion, Geomatrix instead used ISC-PRIME for all model runs. This version of the ISC model employs an updated algorithm to evaluate building downwash and calculates concentrations for receptors both inside and outside of the cavity region of buildings.

- The maximum predicted concentrations for each pollutant and applicable averaging period are compared to the EPA's significant impact levels (SILs) in Section 5.6. Each pollutant was also combined with background concentrations (provided in an e-mail by Kevin Schilling of DEQ on June 13, 2005) and compared to the NAAQS.

- Point source emission parameters used in the model were based on those provided in the Title V permit application, but have been updated. Volume source parameters were based on the physical dimensions of the volume source or nearby structures that would influence the volume source. These parameters are discussed in Sections 5.2 and 5.3.

- Point sources with rain caps or horizontally oriented stacks are identified in Section 5.2. Rain capped stacks were accounted for in the modeling by limiting the exit velocity to 0.001 meters per second (m/s) to eliminate the contribution of the exhaust gas momentum to plume rise. Similarly, horizontally oriented stacks were accounted for by limiting the exit velocity in the same way as rain capped sources, and the stack diameters were reduced to 0.001 meters in order to eliminate stack tip downwash calculations. This procedure is conservative, in that it eliminates initial plume rise due to buoyancy.

- The rural modeling option was selected for the ISCST3 simulations based not only on the population density indicated by the LandView III software, as described in the protocol, but because the majority of the land surrounding the MTI Facility is zoned for agriculture.

- As described in the protocol, Geomatrix confirmed that the 50-meter resolution receptor grid captured the predicted maxima, at or near the western ambient air boundary.

- Ten-meter resolution digital elevation model (DEM) USGS data were used to find elevations of the receptors, the stacks, and the base of the buildings.

5.2 Existing Point Sources

Sources for which a single emission location can be identified were included in the model as point sources. Tables in Appendix L identify the point sources included in the modeling, along with the emission rates, emission parameters and locations associated with the point sources. Stack parameters, including temperatures and exit velocities (or flow rates), correspond to the descriptions provided in the MTI Tier I permit application, with updates and corrections provided by a recent inventory done at MTI.

However, the source naming scheme used in this application differs from that used in previous MTI applications. Generally, each name consists of a building number, a dash, the point source type, another dash, and a two-digit number. Boilers are type "BOI", emergency generators are type "GEN", cooling towers are type "COOL", and VOC abatement units are type "VOC. Scrubbers are either "FS" for acid scrubbers, "AMS" for ammonia scrubbers, or "MPS" for multi-purpose scrubbers.

In the model runs, the dashes were omitted (an ISC requirement) and an "N" for "new" was appended to the end of all proposed sources' names. For example, MTI uses the name "25-BOI-10" to refer to a proposed boiler. This source is given as "25BOI10N" in the modeling files. A listing of the proposed sources is given in Table 5-1.

All points are vertical releases with the exception of the stacks exhausting the generators associated with Building 15 (15-GEN-01) and Building 10 (10-GEN-01), which are released horizontally. All boiler stacks are equipped with rain caps. Note that several scrubbers are operated in "standby" mode, and are listed as having zero emissions. These are redundant scrubbers, and emit only when the flow to another scrubber is diverted in cases of malfunction or maintenance. Criteria pollutant emissions from the various VOC abatement units were calculated based on combustion of natural gas, using AP-42 emission factors and the known firing rates (MMBtu/hr) of each unit.

5.3 VOLUME (FUGITIVE PM10) SOURCES

Volume sources were used in the model simulations to represent fugitive emissions. The only modeled fugitive emissions at the MTI Facility are PM10 and VOCs. Appendix M summarizes the emission rates and parameters of the volume sources used to model fugitive sources and which buildings or areas are associated with each source. Only building 22, (Water Services) emits PM10 as a fugitive. In the 2003 Tier II submittal, buildings 15 (Fab 1B) and 26 (Test) also emitted PM10 as a fugitive. However, upon further review, MTI determined that the emissions from these areas are emitted from point sources. Consequently, these emissions were modeled from each building's worst-case scrubber. Table M-1 shows the relationship between model parameters and physical dimensions of the building, and Table M-2 shows the PM10 fugitive emission rate.

TABLE 5-1

GROWTH COMPONENT EMISSIONS

Model ID	Device	CO (T/Yr)	NOx (T/Yr)	PM10 (T/Yr)	SO2 (T/Yr)
Potential construction of additional manufacturing capacity (new Fab unit): (a)					
NF-FS-01	Acid Scrubber	0	0	1.04	0
NF-FS-02	Acid Scrubber	0	0	1.04	0
NF-FS-03	Acid Scrubber	0	0	1.04	0
NF-FS-04	Acid Scrubber	0	0	1.04	0
NF-FS-05	Acid Scrubber	0	0	1.04	0
NF-FS-06	Acid Scrubber	0	0	1.04	0
NF-VOC	VOC Abatement Device	0.74	0.88	0.07	0
NF-BOI-01	Boiler	3.29	3.94	0.80	0.06
NF-BOI-02	Boiler	3.29	3.94	0.80	0.06
NF-BOI-03	Boiler	3.29	3.94	0.80	0.06
NF-BOI-04	Boiler	3.29	3.94	0.80	0.06
NF-GEN-01	Emergency Generator	1.19	3.26	0.09	0.74
NF-GEN-02	Emergency Generator	1.19	3.26	0.09	0.74
Potential construction of additional manufacturing capacity (new Mask facility):					
JV2-BOI-01	Six Boilers (common duct)	4.2	5.01	0.46	0.03
JV2-GEN-01	Emergency Generator	1.19	3.26	0.09	0.74
JV2-GEN-02	Emergency Generator	1.19	3.26	0.09	0.74
JV2-FS-01	Acid Scrubber	0	0	0.02	0
JV2-FS-02	Acid Scrubber(b)	0	0	0	0
JV2-VOC	VOC Abatement Device	0.33	0.39	0.03	0.002
Other proposed devices:					
25-BOI-10	Boiler	3.29	3.94	0.80	0.06
16-GEN-01	Emergency Generator	1.19	3.26	0.09	0.74
24-GEN-02	Emergency Generator	1.19	3.26	0.09	0.74
26-GEN-02	Emergency Generator	1.19	3.26	0.09	0.74
36-GEN-03	Emergency Generator	1.19	3.26	0.09	0.74
80-GEN-02	Emergency Generator	1.19	3.26	0.09	0.74
26-FS-03	Acid Scrubber	0	0	1.6e-5	0
24D-AMS-02	Ammonia Scrubber(b)	0	0	0	0
24D-MPS-02	Multi-purpose Scrubber(b)	0	0	0	0

(a) Two locations for a possible new fabrication unit are being considered. The inventories for the new unit would be the same, so emissions for only one fabrication unit are is listed here even though two fabrication unit locations were evaluated in the modeling.

(b) Redundant units; flow is normally routed to existing units listed in Appendix L.

5.4 FEC SCENARIOS FOR CRITERIA POLLUTANTS

To assess whether the proposed FEC emissions, including baseline actual emissions, the growth component, and the operational variability component provided for under the FEC, might cause or significantly contribute to a NAAQS exceedance, Geomatrix evaluated a series of modeling scenarios. These scenarios are intended to span the possible combinations of the anticipated and unanticipated changes at the Facility. For example, MTI may choose one of two possible locations for potential construction of additional manufacturing capacity and the associated wet scrubbers, VOC abatement units, boilers and emergency generators.

Furthermore, the operational variability component emissions are not associated with any particular point, area or volume source. They are intended to allow changes to the Facility, without knowing the exact device or location or quantity of emissions to be added. Lacking stack parameters and location information, the modeler is faced with the problem of conservatively accounting for these possible changes in emissions and demonstrating they will not cause or significantly contribute to a NAAQS exceedance. Geomatrix therefore evaluated a range of reasonable operating scenarios that are intended to span the possible extremes in impacts. Geomatrix attempted to strike a balance between ensuring conservatism while dismissing unreasonable or unlikely possibilities.

5.4.1 Growth Component

MTI has identified a list of potential new equipment and the locations where they would likely be installed. This list is given in Table 5-1, and includes two possible building locations for the potential construction of additional manufacturing capacity (new Fab), shown in hatched-blue in Figure L-2. The potential location adjacent to building 1X is labeled as “NF” for “North Fab”, and the location adjacent to building 24 is labeled as “SF” for “South Fab”. Additionally, MTI has entered into an agreement with Photronics to construct a new Mask shop.

The potential new Fab unit would include six wet scrubbers, one VOC abatement unit, four boilers, and two emergency generators. Note that MTI intends to potentially build at either the North Fab location or the South Fab location, not both. New wet scrubber and VOC abatement unit stack parameters were taken to be the same as an existing wet scrubber (1X-FS-01), and new VOC abatement unit (1X-VOC), respectively. The new boilers and new generators were taken to be similar to the existing boiler 4-BOI-05 and existing generator 24D-GEN-02.

Using source groups, both building locations were assessed in the same model run, but only the results from the building location with the higher predicted concentrations are presented below.

The northern location alternative uses the "NorthFab" group and the southern alternative uses the "SouthFab" group. Thus the customary "ALL" group is missing from the modeling files.

The potential new Mask shop would be very similar to the existing Mask shop in building 80. It would include six new boilers (2 MMBtu/hr each) exhausting through a single release point, taken to be similar to the existing boilers exhausting through 80-BOI-01. The potential new Mask shop would also have two emergency generators, taken to be similar to 24D-GEN-02. Two new wet scrubbers and a VOC abatement device would also be installed, and were taken to be similar to 80-FS-01, 80-FS-02 and 80-VOC.

MTI has also identified a list of equipment it intends to install within the near future that is not associated with the potential construction of the new Fab building or the new Mask shop. This list includes a boiler in building 25; emergency generators for buildings 16, 24, 26, 36, and 80; two standby scrubbers for building 24, and an acid scrubber for building 26. Stack parameters and emission rates were taken from similar existing units (4-BOI-09, 24D-GEN-02, and the scrubber adjacent to each proposed scrubber, respectively).

5.4.2 Unit Emissions Modeling

An initial "Chi/Q" model run was performed with all stacks, including existing stacks, those associated with the two possible new fabrication building locations described above, and the other proposed sources listed in Table 5-1. All existing and proposed boilers were modeled both with and without rain caps. Each "non-capped" boiler was modeled using its actual exit velocity, and an "NC" was appended to its name (some names were shortened to be no more than eight characters, as required by ISC). All sources were assigned an emission rate of 1.0 lb/hr.

Some general conclusions that can be drawn from the "Chi/Q" modeling runs include:

- 16-FS-02 is the worst-case wet scrubber.
- 4-BOI-04(NC) is the worst-case non-capped boiler.
- NF-BOI-02(NC) is the worst-case non-capped stack for the North Fab.
- SF-GEN-01 is the worst-case non-capped stack for the South Fab.

The results were used to identify which sources have the highest off-site impacts, and are to be used both for modeling the various FEC scenarios and for modeling substances listed at IDAPA 58.01.01.585 and 586.

Buildings 32 and 80 are located northwest and northeast of the main cluster of buildings at the MTI Facility, and MTI has indicated that future growth of manufacturing will not occur at or near these buildings. These sources were therefore excluded from consideration as locations for the worst case manufacturing emissions.[8] Scrubbers are not combustion sources[9] and were therefore excluded from consideration as the worst-case source of combustion-related emissions. Emergency generators limited to 200 hr/yr of operation are exempt from permitting, and typically operate only about 20 hours per year, and were therefore also excluded from consideration. See the baseline emissions calculations in Appendix G for a comparison of combustion related emissions.

The "worst-case stack" for criteria pollutants is the worst-case non-capped boiler. The worst-case wet scrubber is used for the analysis of substances listed at IDAPA 58.01.01.585 and 586.

5.4.3 Growth Plus Operational Variability Ambient Impact Assessment

The Operational Variability Component (OVC) emissions are not associated with any particular stack, building or area within the plant. Therefore, Geomatrix developed a set of modeling scenarios intended to span the possible choices about how to distribute these emissions. Considering that the maximum allowable FEC increase is an order of magnitude larger than any individual existing MTI source, it would not be a fair treatment to model this increase as being emitted by the worst-case source (4-BOI-01, rain-capped boiler). Rain caps limit the dispersion, and would severely over-estimate the impact of what will presumably be a more widely distributed increase. Therefore, non-process-related increases (e.g. CO, NOx) were modeled as coming from the worst non-capped boiler stack. Note that stacks at the proposed new Mask shop are also excluded from the "worst-case stack" assessment because no additional development is anticipated in this area.

The following modeling scenarios were evaluated:

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[8] The FEC rule includes a procedure for analysis of potential impacts resulting from unanticipated changes that may not have been adequately addressed in the FEC permit application. If MTI does find it necessary to develop a new facility in the vicinity of building 32 or 80, MTI will follow the evaluation procedures in the FEC rule.
[9] Most of MTI's combustion related emissions are from boilers. See the baseline FEC calculations in Appendix G.

Scenario 1: "Proportional"

- All existing sources are increased proportionally by the OVC emissions, regardless of whether the increased emission rate exceeds each unit's physically possible emission rate.[10]
- PM10 increases are distributed proportionally over wet scrubbers, VOC abatement units, emergency generators, boilers, cooling towers, and fugitive emissions; CO, NOx and SO2 increases are distributed only over emergency generators and boilers.
- The growth component (Table 5-1) sources are included as proposed, but are not included in the sources to be increase proportionally by the OVC emissions. Limiting the OVC emission to fewer (i.e. only existing) sources is conservative in that it is less widely distributed.
- This scenario is designed to capture a distributed increase and is likely to be the most realistic of the scenarios.

Scenario 2: "Single Stack"

- All OVC emissions are assumed to be emitted by the worst-case non-capped source (4-BOI-04NC) as identified by the "Chi/Q" run.
- All existing sources are included, using their hypothetical maximum emission rates.
- The growth component (Table 5-1) sources are included, using their hypothetical maximum emission rates.
- This scenario is designed to capture the possibility that all the OVC emissions are located in the worst possible yet plausible location.

Scenario 3: "Single Building"

- All OVC emissions are assumed to be emitted by the worst-case new building location, from the worst-case new building stack (NF-BOI-02NC or SF-GEN-01).
- All existing sources are included, using their hypothetical maximum emission rates.
- The growth component (Table 5-1) sources are included, using their hypothetical maximum emission rates.

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[10] For example, the sum of the hypothetical maximum PM10 emissions from existing sources is 21.8 lb/hr and 38.8 TPY. The hypothetical maximum emission rates from 4-BOI-01 are 0.09 lb/hr and 0.4 TPY. It is instead modeled as emitting $0.09 + 0.09/21.8 \times (14*2000/8760) = 0.10$ lb/hr (0.0131 g/s) and $0.4 + 0.4/38.8 \times 14 = 0.54$ TPY (0.0156 g/s). Note that due to the generators being limited to 200 hr/yr of operation, the sum of the maximum short term emissions from existing sources is 21.8 lb/hr which is not equivalent to 38.8 TPY.

- This scenario is designed to answer the question "what if the OVC emissions are located near the new building, which could by itself emit more than 50% as much as the OVC?"

Tables 5-2 through 5-5 present predicted criteria pollutant concentrations attributable solely to MTI sources as well as total concentrations resulting from the addition of DEQ-provided background values for the area. These total concentrations are then compared to the NAAQS to determine compliance.

Geomatrix predicts compliance with the NAAQS for all scenarios. Even in the most conservative scenario, where the entire operational variability component is assumed to be emitted by the worst-case non-capped stack MTI's impact with background is within the NAAQS

TABLE 5-2

CRITERIA POLLUTANT MODELING RESULTS, "PROPORTIONAL" SCENARIO

Pollutant	Period	Maximum Predicted Concentration (μg/m³)	Background Concentration (μg/m³)	Prediction Plus Background (μg/m³)	NAAQS (μg/m³)	Percent of NAAQS
CO	1-hour	1671	12,200	13,871	40,000	35%
	8-hour	812	6,800	7,612	10,000	76%
NO2[a]	Annual	36	40	76	100	76%
SOx	3-hour	676	42	718	1,300	55%
	24-hour	314	26	340	365	93%
	Annual	2	8	10	80	12%
PM10	24-hour[b]	64	80	144	150	96%
	Annual	11	18	29	50	58%

a) 75% conversion of NOx to NO2 assumed.
b) Highest 6th-high in 5 years

TABLE 5-3

CRITERIA POLLUTANT MODELING RESULTS, "SINGLE STACK" SCENARIO

Pollutant	Period	Maximum Predicted Concentration (μg/m³)	Background Concentration (μg/m³)	Prediction Plus Background (μg/m³)	NAAQS (μg/m³)	Percent of NAAQS
CO	1-hour	1618	12,200	13,818	40,000	35%
	8-hour	788	6,800	7,588	10,000	76%
NO2[a]	Annual	39	40	79	100	79%
SOx	3-hour	675	42	717	1,300	55%
	24-hour	313	26	339	365	93%
	Annual	2	8	10	80	12%
PM10	24-hour[b]	69	80	149	150	99%
	Annual	13	18	31	50	62%

a) 75% conversion of NOx to NO2 assumed.
b) Highest 6th-high in 5 years.

TABLE 5-4

CRITERIA POLLUTANT MODELING RESULTS, "SINGLE BUILDING" SCENARIO

Pollutant	Period	Maximum Predicted Concentration (μg/m³)	Background Concentration (μg/m³)	Prediction Plus Background (μg/m³)	NAAQS (μg/m³)	Percent of NAAQS
CO	1-hour	1736	12,200	13,936	40,000	35%
	8-hour	837	6,800	7,637	10,000	76%
NO2[a]	Annual	32	40	72	100	72%
SOx	3-hour	676	42	718	1,300	55%
	24-hour	314	26	340	365	93%
	Annual	2	8	10	80	13%
PM10	24-hour[b]	59	80	139	150	93%
	Annual	10	18	28	50	55%

a) 75% conversion of NOx to NO2 assumed.
b) Highest 6th-high in 5 years.

5.4.4 Dispersion Modeling of Lead FEC

As described in Section 4.1, MTI is requesting a FEC for lead (Pb) of 120 pounds per year. The National Ambient Air Quality Standard for lead is based on a calendar quarter averaging period, but there is no convenient way using ISC-PRIME to calculate such an average. Instead, a separate ISC-PRIME "Chi/Q" modeling run was performed, and monthly averages were output. As in the run described in Section 5.4.2, this run used a unit emission rate of 1.0 lb/hr from each included stack.

Inspection of the "Chi/Q" modeling run described in Section 5.4.2 results shows that the worst-case stack for the annual averaging period was not the worst-case stack for the 24-hour averaging period. Since the monthly averaging period falls between the two, Geomatrix chose the six stacks that had the highest Chi/Q for 24-hour and annual averaging periods. Thus, Geomatrix can be reasonably assured of finding the worst-case stack for a monthly averaging period without having to include every stack. The six stacks included the first four boilers near building 4 (4-BOI-01 through 4-BOI-04) and the two scrubbers in building 16 (16-FS-01 and 16-FS-02). 16-FS-02 was shown to have the highest impact for monthly averaging periods, with a Chi/Q of 5.487 μg/m³ per lb/hr.

As shown in Table 5-5, multiplying this Chi/Q factor by 0.014 lb/hr (i.e. 120 lb/yr) results in a maximum predicted concentration of 0.08 μg/m³ (monthly average). The NAAQS for lead is 1.5 μg/m³ (calendar quarter average). Because quarterly average concentrations would be lower than monthly averages, a monthly average of 0.08 ug/m^3 would result in compliance with the quarterly NAAQS by a wide margin.

TABLE 5-5

CRITERIA POLLUTANT MODELING RESULTS FOR LEAD

Pollutant	Period	Maximum Predicted Concentration (µg/m^3)	Background Concentration (µg/m^3)	Prediction Plus Background (µg/m^3)	NAAQS (µg/m^3)	Percent of NAAQS
Lead	Calendar Quarter	0.08[a]	-	0.08	1.5	5%

a) Maximum predicted concentration is for the monthly averaging period, not quarterly.

5.5 MODELING OF SUBSTANCES LISTED AT IDAPA 58.01.01.585 AND 586

5.5.1 Process Emissions

As described in Section 4.2, MTI maintains a comprehensive chemical purchasing and tracking system. This system was presented to DEQ staff during a site visit on May 4-5, 2005. Using that system, MTI identified the maximum annual emission rate (lb/yr) of each substance listed at IDAPA 58.01.01.585 and 586 from four recent years of emission data (see Table 4-2 and Appendix H).

MTI is requesting a FEC that allows an increase in VOCs emissions of approximately 80 percent over baseline emissions. Geomatrix assumed that the increase in substances listed at IDAPA 58.01.01.585 and 586 would increase proportionally to the increase VOC emissions. Based on this assumption, Geomatrix converted annual manufacturing process emissions to an hourly emission rate (lb/hr) for comparison with the screening emission limits (EL) specified in IDAPA 58.01.01.585 and 586. Note that generator emissions of substances listed at IDAPA 58.01.01.585 and 586 are not included in the analysis because existing and proposed generators operate fewer than 200 hours per year and are therefore not subject to the PTC process.[11] Boiler emissions of substances listed at IDAPA 58.01.01.585 and 586 are addressed below in Section 5.5.2.

[11] Note, however, that emissions of criteria pollutants from generators are included in the NAAQS analysis required by the Tier II rules.

Using this 80% factor, eighteen chemical species would be emitted at rates that (Facility-wide) exceed the EL. For each of those species, Geomatrix scaled the emission rate (lb/hr) by the maximum predicted concentration ($\mu g/m^3$) of the "Chi/Q" run described in Section 5.4.2. For those substances addressed with a 24-hour averaging period (i.e. IDAPA Section 585), Geomatrix found that source 16-FS-01 had the maximum predicted impact. For those substances addressed with an annual averaging period (i.e. IDAPA Section 586), Geomatrix found that source 16-FS-02 had the maximum predicted impact. After scaling the emission rate for each substance by their respective scaling factors, Geomatrix found that no substances listed at IDAPA 58.01.01.585 and 586 were predicted to exceed the AAC or AACC. Predicted concentrations for substances emitted at rates exceeding their ELs are presented in Table 4-2.

This is a very conservative approach because it assumes the entire increase in emissions come from a single (worst-case) stack, and greatly over-predicts the highest impact. See section 4.2 for additional discussion.

5.5.2 Proposed Boilers

Few of the substances listed at IDAPA 58.01.01.585 and 586 are emitted by both the boilers and the process sources. In order to simplify the ambient impact assessment and future compliance monitoring, Geomatrix evaluated emissions of substances listed at IDAPA 58.01.01.585 and 586 from the proposed eleven new boilers separately from process sources.

The methodology is virtually identical to that used for the process emissions. Based on the "Chi/Q" run described in Section 5.4.2, Geomatrix determined that of all the existing (rain-capped) boilers, 4-BOI-01 had the highest Chi/Q for both the annual and 24-hour averaging period. Geomatrix multiplied the emissions resulting from 162 MMBtu/hr (5 proposed boilers each 30 MMBtu/hr, plus 6 boilers each 2 MMBtu/hr) by the scaling factors to find maximum predicted concentrations, for comparison with the AAC/AACC. As shown in Table 5-6, emissions from the new boilers are all less than the ELs or AAC/AACC.

This approach is very conservative, as it assumes the emission from all boilers come from the same, worst-case stack. This provides the necessary demonstration of compliance with IDAPA 58.01.01.210 for installation of the new boilers, and additional analysis at the time of installation is not warranted.

TABLE 5-6

PROPOSED NEW BOILERS[12] - EMISSIONS OF SUBSTANCES LISTED AT IDAPA 58.01.01.585 AND 586

CAS Number	Pollutant	Emission Factor (lb/MMscf)[a]	Hourly Emissions (lb/hr)	Annual Emissions (T/yr)	Screening Emission Level (lb/hr)	Over the Screening Emission Level?	Max Predicted Impact (µg/m³)	IDAPA AAC/ AACC (µg/m³)	Over AAC/ AACC?	% of AAC/ AACC
56-49-5	3-Methylchloranthrene	1.80E-06	2.78E-07	1.22E-06	2.50E-06					
71-43-2	Benzene	2.10E-03	3.24E-04	1.42E-03	8.00E-04					
50-32-8	Benzo(a)pyrene	1.20E-06	1.85E-07	8.11E-07	2.00E-06					
106-46-7	1,4-Dichlorobenzene	1.20E-03	1.85E-04	8.11E-04	30					
50-00-0	Formaldehyde	7.50E-02	1.16E-02	5.07E-02	5.10E-04	Yes	2.73E-02	7.70E-02	No	35
110-54-3	Hexane	1.8	2.78E-01	1.22E+00	12					
91-20-3	Naphthalene	6.10E-04	9.41E-05	4.12E-04	3.33					
109-66-0	Pentane	2.6	4.01E-01	1.76E+00	118					
108-88-3	Toluene	3.40E-03	5.25E-04	2.30E-03	25					
7440-38-2	Arsenic	2.00E-04	3.09E-05	1.35E-04	1.50E-06	Yes	7.28E-05	2.30E-04	No	32
7440-39-3	Barium	4.40E-03	6.79E-04	2.97E-03	0.033					
440-41-7	Beryllium	1.20E-05	1.85E-06	8.11E-06	2.80E-05					
7440-43-9	Cadmium	1.10E-03	1.70E-04	7.43E-04	3.70E-06	Yes	4.00E-04	5.60E-04	No	71
	Chromium-Total[b]	1.40E-03	2.16E-04	9.46E-04						
7440-47-3	Chromium III	1.15E-03	1.77E-04	7.76E-04	3.30E-02					
7440-47-3	Chromium VI	2.52E-04	3.89E-05	1.70E-04	5.60E-07	Yes	9.17E-05	2.50E-02	No	0.4
7440-48-4	Cobalt	8.40E-05	1.30E-05	5.68E-05	0.0033					
7440-50-8	Copper	8.50E-04	1.31E-04	5.74E-04	0.013					
7439-96-5	Manganese	3.80E-04	5.86E-05	2.57E-04	0.067					
	Mercury	2.60E-04	4.01E-05	1.76E-04	0.001					
7439-98-7	Molybdenum	1.10E-03	1.70E-04	7.43E-04	0.333					
7440-02-0	Nickel	2.10E-03	3.24E-04	1.42E-03	2.70E-05	Yes	7.64E-04	4.20E-03	No	18

[12] Assumes 11Boilers (162 MMBtu/hr total).

CAS Number	Pollutant	Emission Factor (lb/MMscf)[a]	Hourly Emissions (lb/hr)	Annual Emissions (T/yr)	Screening Emission Level (lb/hr)	Over the Screening Emission Level?	Max Predicted Impact (µg/m³)	IDAPA AAC/ AACC (µg/m³)	Over AAC/ AACC?	% of AAC/ AACC
7782-49-2	Selenium	2.40E-05	3.70E-06	1.62E-05	0.013					
7440-66-6	Zinc	2.90E-02	4.47E-03	1.96E-02	0.667					
10024-97-2	Nitrous oxide	2.2	3.39E-01	1.49E+00	0.667					
	PAHs:									
	Benz(a)anthracene	1.80E-06	2.78E-07	1.22E-06						
	Benzo(a)pyrene	1.20E-06	1.85E-07	8.11E-07						
	Benzo(b)fluoranthene	1.80E-06	2.78E-07	1.22E-06						
	Benzo(k)fluoranthene	1.80E-06	2.78E-07	1.22E-06						
	Chrysene	1.80E-06	2.78E-07	1.22E-06						
	Dibenzo(a,h)anthrancene	1.20E-06	1.85E-07	8.11E-07						
	Indeno(1,2,3-cd)pyrene	1.80E-06	2.78E-07	1.22E-06						
	PAH Total		**1.8E-06**	**7.7E-06**	9.10E-05					

(a) Emission Factors from AP-42 Section 1.4, Natural Gas Combustion, July 1998.

Appendix A: 2003 Tier II Application Completeness Determination

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

RECEIVED
JUN 0 8 2003
BY:

1410 North Hilton • Boise, Idaho 83706-1255 • (208) 373-0502

Dirk Kempthorne, Governor
C. Stephen Allred, Director

June 2, 2003

Certified Mail No. 7000 1670 0013 9129 3803

Mr. Rob Sterling
Environmental Manager
Micron Technologies, Inc.
8000 S. Federal Way
Boise, ID 83707

RE: AIRS Facility No. 001-00044, Micron Technologies, Inc., Boise
Tier II Operating Permit Application Administrative Completeness Determination

Dear Mr. Sterling:

On March 14, 2003, the Department of Environmental Quality (Department) received Micron Technologies, Inc.'s (Micron) Tier II operating permit application. The materials have been reviewed, and the application has been determined administratively complete. Therefore, the Department will proceed with the processing of Micron's application in accordance with IDAPA 58.01.01.404 *Rules for the Control of Air Pollution in Idaho (Rules)*.

Although the application has been declared administratively complete, we may need to solicit further information to assist us during our review. Any additional information requested by the Department should be submitted in accordance with the *Rules*.

Please be aware that you may submit a written request to the Department to provide a draft permit for review prior to the required public comment period.

If you have any questions about this project or the permitting process, please contact me at 373-0437 or wrogers@deq.state.id.us..

Sincerely,

Bill Rogers

Bill Rogers
Permit Program Coordinator
Air Quality Division

BR Permit No. T2-030010

Appendix B: FEC Rule

When physical conditions such as tall adjacent buildings, valley and mountain terrain, etc., are such as to limit the normal dispersion of air pollutants, the Board may set more restrictive emission limitations on those sources affected by the unusual conditions when air quality standards would reasonably be expected to be exceeded. (5-1-94)

163. SOURCE DENSITY.

Should areas develop where each individual source is meeting the requirements of this chapter, yet the ambient air quality standards are being exceeded or might reasonably be expected to be exceeded, the Board may set more restrictive emission limits than are contained in this chapter. (5-1-94)

164. POLYCHLORINATED BIPHENYLS (PCBS).

01. Prohibition on Burning. Burning any material containing greater than five (5) parts per million of polychlorinated biphenyls (PCBs) is prohibited, except for incineration for the purpose of disposal. Incineration for disposal shall comply with the following provisions: (5-1-94)

a. No person shall commence construction or modification of a PCB incinerator without a permit issued according to Sections 200 through 225. (5-1-94)

b. The Department must provide opportunity for public comments prior to a final decision for a permit to construct or modify a new PCB incinerator. (5-1-94)

c. A permit issued according to Sections 200 through 225 for construction or modification of a PCB incinerator shall require, as a minimum, best available control technology and monitoring instrumentation. (5-1-94)

d. No permit to operate, construct or modify a PCB incinerator shall be processed or issued prior to March 16, 1987, or such earlier date as shall be determined by the State Board of Environmental Quality. (5-1-94)

02. Prohibition on Sales. No person shall sell, distribute or provide any materials containing greater than five (5) parts per million PCBs for home or commercial heating equipment. (5-1-94)

165. – 174. (RESERVED).

175. PROCEDURES AND REQUIREMENTS FOR PERMITS ESTABLISHING A FACILITY EMISSIONS CAP.

The purpose of Sections 176 through 181 is to establish uniform procedures to obtain a Facility Emissions Cap (FEC) for stationary sources or facilities (hereinafter referred to as facility or facilities). A permit establishing a FEC will be issued pursuant to Sections 200 through 228 or Sections 400 through 410. (4-11-06)

176. FACILITY EMISSIONS CAP.

01. Optional Facility Emissions Cap. An owner or operator of a facility may request a FEC to establish an enforceable facility-wide emission limitation. (4-11-06)

02. Applicability. (4-11-06)

a. The owner or operator of any facility, which is not a major facility as defined in Sections 204 or 205, may apply to the Department for a permit to establish a FEC, (4-11-06)

b. FECs are available to new sources, existing sources undergoing a modification, and existing sources that request a FEC. (4-11-06)

03. Definitions. For the purposes of Sections 175 through 181, the following terms shall be defined as below. (4-11-06)

a. Baseline actual emissions. As defined in Section 007. (4-11-06)

b. Design concentration. The ambient concentration used in establishing the FEC. (4-11-06)

c. Facility emissions cap (FEC). A facility-wide emission limitation expressed in tons per year, for any criteria pollutant or hazardous air pollutant established in accordance with Sections 176 through 181. A FEC is calculated using baseline actual emissions plus an operational variability component and a growth component. (4-11-06)

d. FEC pollutant. The pollutant for which a FEC is established. (4-11-06)

e. Growth component. The level of emissions requested by the applicant and approved by the Department to allow for potential future business growth or facility changes that may increase emissions above baseline actual emissions plus the operational variability component. (4-11-06)

f. Operational variability component. The level of emissions up to the significant emission rate (SER) minus one (1) ton per year but no more than the facility's potential to emit (PTE). If the proposed FEC pollutant does not have a SER listed in Section 006 or has a SER less than or equal to ten (10) tons per year, the operational variability component is the level of emissions requested by the applicant and approved by the Department. (4-11-06)

177. APPLICATION PROCEDURES.

In addition to the information required pursuant to Sections 202 or 402, whichever is applicable, applications requesting a FEC must include the information required under Sections 176 through 181 and Subsections 177.01 through 177.03. (4-11-06)

01. Estimates of Emissions. A proposed FEC for each pollutant requested by the facility, including the basis for calculating the FEC. (4-11-06)

02. Estimates of Ambient Concentrations. (4-11-06)

a. Estimates of ambient concentrations will be based on the most recent applicable and technically appropriate methods and most representative data available to the Department unless otherwise approved by the Department. (4-11-06)

b. Estimates of ambient concentrations may include projections of alternative future changes within the proposed FEC. (4-11-06)

c. For a new, existing, or modified facility, a demonstration that for each FEC pollutant, the FEC will not cause or significantly contribute to a violation of any ambient air quality standard. (4-11-06)

d. For renewal of terms and conditions establishing a FEC, it is presumed that the previous permitting analysis is satisfactory, unless the Department determines otherwise. (4-11-06)

03. Monitoring and Recordkeeping. The application must include proposed means for the facility to determine facility emissions on a rolling twelve (12) month consecutive basis. (4-11-06)

178. STANDARD CONTENTS OF PERMITS ESTABLISHING A FACILITY EMISSIONS CAP.

In addition to the elements required by Sections 203 and 211 or Sections 403 and 405, whichever is applicable, the Department shall have the authority to impose, implement and enforce the terms in Subsections 178.01 through 178.05 and conditions establishing a FEC. (4-11-06)

01. Emission Limitations and Standards. All permits establishing use of a FEC shall contain annual facility wide emissions limitations for each FEC pollutant. (4-11-06)

02. Monitoring. All permits establishing a FEC shall contain sufficient monitoring to ensure compliance with the FEC on a rolling twelve (12) month consecutive basis. (4-11-06)

03. Recordkeeping. All permits establishing a FEC shall include the following: (4-11-06)

a. Sufficient recordkeeping to assure compliance with the FEC. (4-11-06)

b. Retention of required monitoring records and support information for a period of at least five (5) years from the date of the monitoring sample, measurement, report or application. Supporting information includes, but is not limited to, calibration and maintenance records and original strip-chart recordings for continuous monitoring instrumentation and copies of all reports required by the permit. (4-11-06)

04. Reporting. All permits establishing a FEC shall include the following: (4-11-06)

a. Sufficient reporting to assure compliance with the permit establishing the FEC. (4-11-06)

b. Submittal of an annual report each year on or before the anniversary date of permit issuance. All required reports must be certified in accordance with Section 123. (4-11-06)

05. Duration. Each permit establishing a FEC shall state that the terms and conditions establishing the FEC are effective for a fixed term of five (5) years. (4-11-06)

179. PROCEDURES FOR ISSUING PERMITS ESTABLISHING A FACILITY EMISSIONS CAP.

01. General Procedures. Procedures for issuing permits establishing a FEC will follow Sections 209 or 404, whichever is applicable. (4-11-06)

02. Renewal. The renewal of the terms and conditions establishing a FEC are subject to the same procedural requirements for issuing permits (Subsection 179.01) and Subsections 179.02.a. through 179.02.d.: (4-11-06)

a. The permittee shall submit a complete application to the Department for a renewal of the terms and conditions establishing the FEC at least six (6) months before, but no earlier than eighteen (18) months before, the expiration date of the existing permit. To ensure that the term of the permit does not expire before the terms and conditions are renewed, the permittee is encouraged to submit the application nine (9) months prior to expiration. (4-11-06)

b. If a timely and complete application for a renewal of the terms and conditions establishing the FEC is submitted, but the Department fails to issue or deny the renewal permit before the end of the term of the previous permit, then all the terms and conditions of the previous permit shall remain in effect until the renewal permit has been issued or denied. (4-11-06)

c. Expiration of the terms and conditions establishing a FEC may be grounds to terminate the facility's right to operate pursuant to Sections 176 through 181, unless a timely and complete renewal application has been submitted. (4-11-06)

d. On renewal, the Department may adjust a FEC with an unused growth component in accordance with the Idaho Environmental Protection and Health Act, Chapter 1, Title 39, Idaho Code, and these rules. (4-11-06)

03. Reopening the FEC. The Department may reopen a FEC to: (4-11-06)

a. Reduce the FEC to reflect newly applicable federal requirements (for example, NSPS) with compliance dates after the issuance of the permit establishing the FEC. (4-11-06)

b. Reduce the FEC consistent with any other requirement that is enforceable as a practical matter, and that the state may impose on the facility under the Idaho Environmental Protection and Health Act, Chapter 1, Title 39, Idaho Code, and these rules. (4-11-06)

04. FEC Termination. The Director may approve a revision of a permit establishing a FEC to terminate the FEC, provided the permittee complies with Subsections 209.04 or 404.04, as applicable, and Subsections 179.04.a. through 179.04.c.: (4-11-06)

a. The permittee may request a revision of the permit establishing the FEC to terminate the FEC at anytime prior to the expiration of the permit. The permittee is encouraged to submit an application for a permit to construct or Tier I operating permit, as applicable, six (6) months prior to the time the permittee wishes to terminate the FEC. (4-11-06)

b. The FEC established in the permit shall remain in effect until the Department issues a new permit to construct or Tier I operating permit, as applicable. (4-11-06)

c. Nothing in Section 179 prohibits a permittee from requesting a permit revision to terminate the FEC during the permit renewal process. (4-11-06)

180. REVISIONS TO PERMITS ESTABLISHING A FACILITY EMISSIONS CAP.

Section 180 requires revisions to terms and conditions establishing a FEC. The permittee is exempt from Sections 200 through 228 unless the permittee chooses to use those rules to process any change to the permit, except as provided in Subsection 180.02. (4-11-06)

01. Criteria. A permit revision is required for the following: (4-11-06)

a. A change to existing monitoring, reporting or recordkeeping requirements in the permit establishing the FEC; (4-11-06)

b. A change to the FEC; or (4-11-06)

c. A change to the facility that would impose new requirements not included in the permit establishing the FEC. (4-11-06)

02. Permit Revision Application Procedures. A permittee may initiate a permit revision by submitting a permit revision application to the Department or by complying with other applicable sections (Sections 200 or 400). For revision of terms and conditions establishing the FEC, it is presumed that the previous permitting analysis is satisfactory unless the Department determines otherwise. A permit revision application shall: (4-11-06)

a. Meet the standard application requirements of Section 177; (4-11-06)

b. Describe the proposed permit revision; (4-11-06)

c. Describe and quantify the change in emissions above the FEC permit limit; and (4-11-06)

d. Identify new requirements resulting from the change. (4-11-06)

03. Permit Revisions. The Department will process permit revisions pursuant to Section 209 or Section 404. (4-11-06)

181. NOTICE AND RECORD-KEEPING OF ESTIMATES OF AMBIENT CONCENTRATIONS.

Section 181 authorizes facility changes that comply with the terms and conditions establishing the FEC, but that are not included in the estimate of ambient concentration analysis approved for the permit establishing the FEC. No permit revision shall be required for facility changes implemented in accordance with Section 181. (4-11-06)

01. Notice. For facility changes that comply with the terms and conditions establishing the FEC, but are not included in the estimate of ambient concentration analysis approved for the permit establishing the FEC, the permittee shall review the estimate of ambient concentration analysis. (4-11-06)

a. In the event that the facility change would result in a significant contribution above the design concentration determined by the estimate of ambient concentration analysis approved for the permit establishing the FEC, but does not cause or significantly contribute to a violation to any ambient air quality standard, the permittee shall provide notice to the Department in accordance with Subsection 181.01.b. (4-11-06)

b. Notice procedures. The permittee may make a facility change under Section 181 if the permittee provides written notification to the Department so that the notification is received at least seven (7) days in advance of the proposed change or, in the event of an emergency, the permittee provides the notification so that it is received at least twenty-four (24) hours in advance of the proposed change. For each such change, the written notification shall: (4-11-06)

i. Describe the proposed change; (4-11-06)

ii. Describe and quantify expected emissions; and (4-11-06)

iii. Provide the estimated ambient concentration analysis. (4-11-06)

02. Recordkeeping. For facility changes that comply with the terms and conditions establishing the FEC, but are not included in the estimate of ambient concentration analysis approved for the permit establishing the FEC, the permittee shall review the estimate of ambient concentration analysis. In the event the facility change would not result in a significant contribution above the design concentration determined by the estimate of ambient concentration analysis approved for the permit establishing the FEC, the permittee shall record and maintain documentation on-site of the review. (4-11-06)

03. Estimates of Ambient Concentrations. Estimates of ambient concentrations shall be consistent with the estimate of ambient concentration analysis approved for the permit establishing the FEC unless the Department determines that other technical methods are appropriate. The permittee shall include any changes to the facility that are not included in the originally approved estimate of ambient concentration analysis. (4-11-06)

182. – 199. (RESERVED).

200. PROCEDURES AND REQUIREMENTS FOR PERMITS TO CONSTRUCT.

The purposes of Sections 200 through 228 is to establish uniform procedures and requirements for the issuance of "Permits to Construct". As used throughout Sections 200 through 228 and 578 through 581, major facility shall be defined as major stationary source in 40 CFR 52.21(b), revised as of July 1, 2005, and major modification shall be defined as in 40 CFR 52.21(b), revised as of July 1, 2005. These CFR sections have been codified in the electronic CFR which is available at www.gpoaccess.gov/ecfr. (4-11-06)

201. PERMIT TO CONSTRUCT REQUIRED.

No owner or operator may commence construction or modification of any stationary source, facility, major facility, or major modification without first obtaining a permit to construct from the Department which satisfies the requirements of Sections 200 through 228 unless the source is exempted in any of Sections 220 through 223, or the owner or operator complies with Section 213 and obtains the required permit to construct, or the owner or operator complies with Sections 175 through 181, or the source operates in accordance with all of the applicable provisions of a permit by rule. (4-11-06)

202. APPLICATION PROCEDURES.

Application for a permit to construct must be made using forms furnished by the Department, or by other means prescribed by the Department. The application shall be certified by the responsible official in accordance with Section 123 and shall be accompanied by all information necessary to perform any analysis or make any determination required under Sections 200 through 228. (7-1-02)

01. Required Information. Depending upon the proposed size and location of the new or modified stationary source or facility, the application for a permit to construct shall include all of the information required by one or more of the following provisions: (5-1-94)

a. For any new or modified stationary source or facility: (5-1-94)

i. Site information, plans, descriptions, specifications, and drawings showing the design of the stationary source, facility, or modification, the nature and amount of emissions (including secondary emissions), and the manner in which it will be operated and controlled. (5-1-94)

ii. A schedule for construction of the stationary source, facility, or modification. (5-1-94)

Appendix C: Oxidizer Control Efficiencies

MTI operates safety devices that oxidize certain potentially dangerous compounds. The trade name for this equipment is a "Guardian System," and information on this system is provided in this appendix. Information on the VOC abatement system is provided in Appendix D.

GUARDIAN® SYSTEMS **MG INDUSTRIES**

GUARDIAN GAS PROTECTION SYSTEM

FACT SHEET

The Guardian Gas Protection System is a patented controlled combustion system that guarantees safe ignition of pyrophoric, flammable and toxic gases after their use in semiconductor manufacturing. Installed in semiconductor companies worldwide, the Guardian handles a variety of process applications.

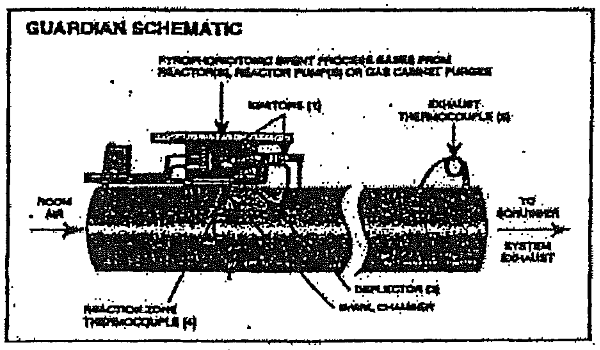
Features

The Guardian Gas Protection System:

- prevents silane explosions and fires; the patented combustion chamber prevents silane bubble formation and guarantees ignition of flammable gases.
- handles flammable process gases used in semiconductor manufacturing, whether silicon or GaAs devices, and vacuum pump oil mist.
- is easily retrofitted to existing lab manufacturing systems.
- is installed at the process reactor or vacuum pump.
- is used to vent gas cabinets and vaults.
- handles normal operation, sudden upsets, reactor pumpdown during start-up, or gas leaks.
- provides fail-safe operation and redundant safety features.
- is available in different sizes to handle a full range of gas flows and concentrations; one unit can handle several reactors at a time.
- requires minimal maintenance; is highly reliable, does not have excessive build up; typically 90-minutes downtime every 3-6 months for preventive maintenance and cleaning.
- has an advanced control and monitoring system; when relays are de-energized for any reason, it warns personnel, and provides a signal to shut down process equipment and activate nitrogen purge systems.
- is cost effective in initial price, maintenance, total utilities required, and length of service.

How the Guardian works

Spent process gases, aspirated into the Guardian Gas Protection System from an Epi or CVD reactor, pass through a wall of flame that guarantees ignition of the flammable waste products.



The flame is provided by a small quantity of hydrogen, or natural gas, ignited by separate platinum-tipped spark plugs (1).

As gases pass through the flame front, they enter a swirl chamber (2) where they are met with a perpendicular air flow which creates shear, thoroughly mixing the gases with air. The swirling action extends combustion chamber residence time and keeps silane from self-protecting. Total combustion is thus ensured. Reaction gases are cooled before exiting.

Air draw from the Scrubber is set to a minimum of three times the flame-front velocity of hydrogen, the fastest-burning gas, preventing heat migration through the air intake.

A deflector (3) forces reacted gases into the center of the air stream, where they are further cooled to below 200°C.

Thermocouples (4 and 5) at the swirl chamber and exit, monitor the temperature of reaction and exit gases. If there are any temperature changes beyond preset limits, the controller (6) (see reverse side) will trigger audible and visual warnings. If programmed, the controller has the capability of providing a signal to interconnect with the process tool to shut down the process equipment and activate the purge system.

The controller also monitors air and fuel pressure, ignitor power, line voltage and, if required, the operaton of the optional Flameguard and Flashback Arrestor.

Quick Reference Chart
Guardian® Gas Conversion

GAS CATEGORY	GASES	DESTRUCTION EFFICIENCY	BY PRODUCTS
Inert	N_2, He, Ar	—	—
Hydrides or Similar Gases	SiH_4	> 99%	SiO_2 and H_2O
	AsH_3	> 99%	As_2, O_3 and H_2O
	PH_3	> 99%	P_2O_5 and H_2O
	B_2H_6	> 99%	B_2, O_3 and H_2O
	TEOS	> 99%	SiO_2, CO_2 and H_2O
	TMB	No Data	—
	TMP	No Data	—
	$SiCl_4$	> 99%	SiO_2, HCl and H_2O
	SiH_2, Cl_2	> 99%	SiO_2, HCl and H_2O
Fluorinated Compounds	NF_3	> 98%	NO_X and HF
	WF_6	About 90%	W_2O_3 and HF
	C_2F_6	> 98%	CO_2 and HF
	CF_4	No Data	—
	SF_6	> 99%	S, SO_X, and HF
	CHF_3	No Data	—
Acid Gases	BF_3	Guardian not suitable as a stand alone treatment system.	—
	Cl_2		—
	BCl_3		—
	HBr		—
	HCl		—
Other Gases	H_2	> 99%	H_2O
	NH_3	> 99%	NO_X and H_2O
	N_2O	—	—
	O_2	—	—

GUAR0095:081194

GUARDIAN® SYSTEMS MG MG INDUSTRIES

Guardian® Gas Conversion Data

Input Gases		Intake	Gas Concentration		
Active (l./min.)	Diluent (l./min.)	Air Flow (m^3/min.)	Inlet (%)	Outlet (ppm)	Conversion Efficiency
SiH_4	N_2				
0.5	5.0	6.57	9.09	<0.03	99.99997%
1.0	5.0	6.57	16.67	<0.03	99.99999%
20.0	20.0	6.57	50.00	<0.03	99.999994%
SiH_4	None				
0.3	N/A	6.57	100	<0.03	99.999997%
3.0	N/A	6.57	100	<0.03	99.999997%
10.0	N/A	6.57	100	<0.03	99.999997%
42.1% PH_3 / H_2	H_2				
0.95	3.05	6.57	10.00	<0.01	99.99999%
0.095	3.91	6.57	1.00	<0.01	99.99999%
42.1% PH_3 / H_2	None				
1.0	N/A	6.57	42.10	<0.01	99.999998%
3.0	N/A	6.57	42.10	<0.01	99.999998%
5.0	N/A	6.57	42.10	<0.01	99.999998%
45.2% AsH_3 / H_2	H_2				
0.3	30.0	6.57	0.45	≤0.01	99.99978%
1.0	30.0	6.57	1.46	<0.34	99.998%
1.5	30.0	6.57	2.15	<0.83	99.996%
0.3	10.0	6.57	1.32	<0.01	99.99993%
1.0	10.0	6.57	4.11	<0.01	99.99998%
2.0	10.0	6.57	7.53	<0.01	99.99979%

GUAR0251-041693

GUARDIAN® SYSTEMS

MG INDUSTRIES

Appendix D: Manufacturing Data on MTI Pollution Control Equipment

Table of Contents

JAEGER PRODUCTS, INC.
HIGH PERFORMANCE TOWER PACKINGS
AND COLUMN INTERNALS

1611 PEACH LEAF
HOUSTON, TEXAS 77039

(281) 449-9500
(800) 678-0345
Fax (281) 449-9400

*REQUESTED TECHNICAL INFORMATION

THIS SERVICE IS PROVIDED AT NO COST.
THE DESIGN DATA AND RECOMMENDATION CONTAINED HEREIN ARE [redacted]
PLEASE REMIND EVERYONE CONCERNED OF THIS [redacted]

January 11, 2001

Mr. Mike Kettner
Micron Technology, Inc.
10A Materials Center
Boise, ID 83716-9632

Cust. Ref: NH_3 & Acid Scrubbers
JPI Inq. #: 0101-9984
Phone: 208-368-4000
Fax #: 208-368-3121

Ref: Efficiency calculations for horizontal scrubber for 3½" *Jaeger Tri-Packs*® in PP.

Calculations:

Project	Scrubbers	Packed bed (ft.)	Gas Flow (cfm)	Liquid Flow (gpm)	Compound	Reagent	Removal (%)	Press Drop (in. w.c./ft.)
PCS-3332 PCS-3409	B24/Fab3 NH_3	6w x 6.75H x 5L	15,000	1) 320	NH_3	H_2SO_4	99.39	0.13
				2) 450	NH_3	H_2SO_4	99.64	0.16
PCS-3576	Bulk Sulfuric Bldg Addition	6w x 6.75H x 5L	15,000	1) 320	HF	NaOH	99.34	0.13
					H_2SO_4	NaOH	95.36	0.13
					HCl	NaOH	98.80	0.13
				2) 450	HF	NaOH	99.60	0.15
					H_2SO_4	NaOH	96.60	0.15
					HCL	NaOH	99.23	0.15
B24 D/E	30K NH_3	8w x 8H x 5L	30,000	400	NH_3	H_2SO_4	99.06	0.20
	30K Acid	8w x 8H x 5L	30,000	400	HF	NaOH	98.98	0.26
					H_2SO_4	NaOH	93.96	0.26
					HCl	NaOH	98.25	0.26
	45K Acid	11w x 8H x 5L	45,000	550	HF	NaOH	98.85	0.30
					H_2SO_4	NaOH	93.51	0.30
					HCl	NaOH	98.05	0.30

Basis: Compounds are incoming with air at 70°F and 13psia. The NH_3 inlet concentration is 500 ppm. The HF, H_2SO_4 & HCl inlet concentrations are 100 ppm each. There is adequate concentration of the reagents in the liquid to react with the compounds in the gas. All calculations are based on proper gas/liquid distribution and include a 1.3 safety margin.

Regards,

M. Nazir

M. Nazir, P.E.
Chief Process Engineer

* ALL DESIGN RECOMMENDATIONS ARE MADE WITHOUT WARRANTY, EXPRESSED OR IMPLIED.

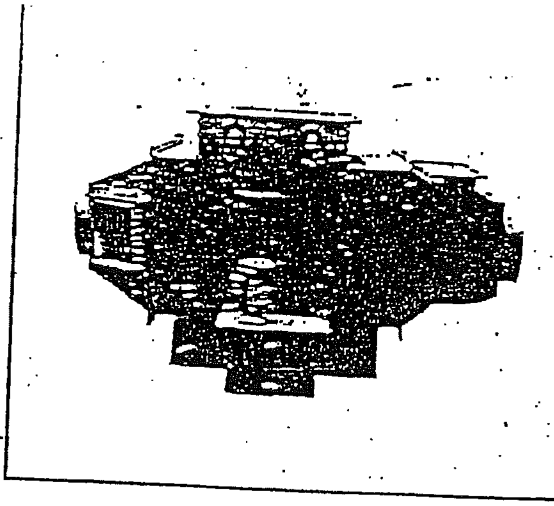
SEE TERMS AND CONDITIONS ON REVERSE SIDE HEREOF

FRP HORIZONTAL SCRUBBER

VIRON®

INTERNATIONAL

VIRON® HORIZONTAL SCRUBBER



The VIRON® Horizontal Scrubber is used in many industrial applications. Its uses include the cleaning of fumes from plating, anodizing, steel pickling, printed circuit board plating, semi-conductor clean rooms, corrosive dust particulate, and corrosive odor control units. When looking through this catalog it will become apparent that VIRON® manufactures many standard units ranging in size from 500 CFM to 100,000 CFM. In addition to our standard sizes, VIRON® will also, upon demand, quote and manufacture custom scrubbers. Our engineering staff is available to discuss your upcoming projects and with 15 years of experience, in manufacturing, we can solve your toughest corrosive fume problems.

STANDARD DESIGN PARAMETERS:

1. High Efficiency
2. Easy Maintenance
3. Minimum Operating Cost
4. Structural Integrity

VHS-SERIES

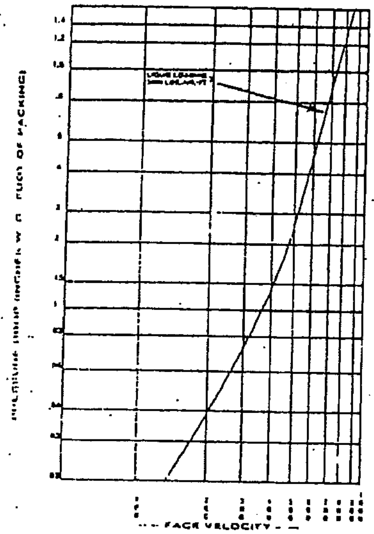
STANDARD FEATURES OF A VIRON® HORIZONTAL SCRUBBER

- Scrubber Housing — FRP — Chemical resistant FRP-Koppers Dion 6693FR, or as specified. Inner corrosion barrier is reinforced with surface veil for maximum chemical resistance.
- Packing Material — Loose fill polypro packing material as manufactured by VIRON® Viro-Pac 250, Tri-Pack® #2 or equal. The velocity through the packing to be 500 FPM. The standard packing depth will range from 12" to 60". Upon appropriate applications VIRON® can increase the packing depth to accomplish higher efficiencies.
- Moisture Eliminator Packing — PVC material as manufactured by VIRON® model #VHE-1025 or equal. The velocity through the packing to be 1200 FPM.
- Spray Nozzles — PVC material as manufactured by Bete-Fog #NCM-0707W or equal. Each nozzle sprays approximately 12 GPM at 20 psi of pump pressure.
- Spray Header — All spray headers are to be PVC schedule 80 pipe, sized for the appropriate flow with true union type ball valves to facilitate removal without having to shut the recirculation system down.
- Recirculation Pumps — All pumps are CPVC material Penguin P Series as standard unless otherwise specified. These pumps are sump pump type without seals and have the capability to run dry for a short period of time without damage.
- Recirculation Rate — Most VIRON® Horizontal Scrubbers have a recirculation rate of between 2 to 10 GPM per square foot of open surface packing area. The recirculation rate for Viron's standard units is 4 GPM per square foot of open surface packing area.
- Self-contained Recirculation Units — The sump pump type recirculation pump is mounted on top of the scrubber sump which is attached to the side of the scrubber housing. The pump motor is bolted to the top of the sump keeping the motor above the highest point of the liquid. The sump pumps inherent design prevents any scrubber liquid from spilling on the floor. This type of unit is used primarily in the warm southern climates where freezing is rare or where the unit is installed inside of a building.
- Remote Recirculation Units — The recirculation pump is mounted to a separate tank which holds the recirculated water. This type of unit is used primarily in cold winter regions where freezing is customary. It may also be used when the scrubber is on the roof and the customer wishes to visually monitor the recirculation flow. Some of the advantages are; less roof weight, no freezing because remote tank is located inside of building, and no scrubber heaters required.
- Optional Equipment —
  - Y-Strainer
  - Flow Meter
  - Solenoid Valves
  - Magnehelic Gauges
  - Neutralizing Chemical Control System
  - pH Monitor with Probe
  - Pressure Gauges
  - Float Valves
  - Sump Heater with Controls
  - Special Lifting Lugs
  - Special Hold Down Lugs
  - Pressure Switch

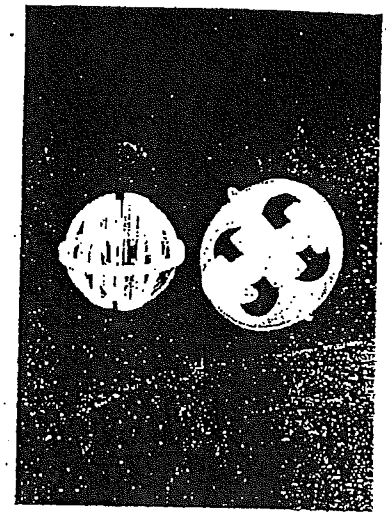
VIRON* COLUMN PACKING MATERIAL

VIRON* uses many different kinds of packing material in its scrubbers. The type and style will depend on the application and the efficiency desired. One of the most popular packings among our customers is the Jaeger Tri-Packs*.

Tri-Packs* is a hollow, spherical column packing constructed of a unique network of ribs, struts and drip rods. It is most distinguished from other column packing in its unusually high ACTIVE surface area, for gas liquid contacting. The liquid used to wet the packing is the scrubber pump recirculation system. This liquid is pumped over the packing and sprayed through nozzles to cover the entire area inside the scrubber housing. This allows the liquid to cover all of the packing area. This is where Tri-Packs* excells over its competitors. Since Tri-Packs* is geometric with structural uniformity, it allows all surfaces to become wet while eliminating nesting and channelling.

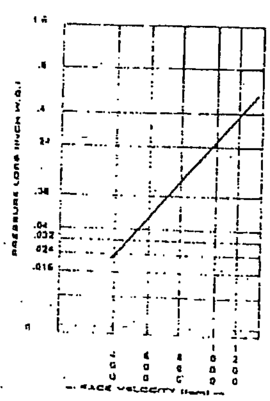


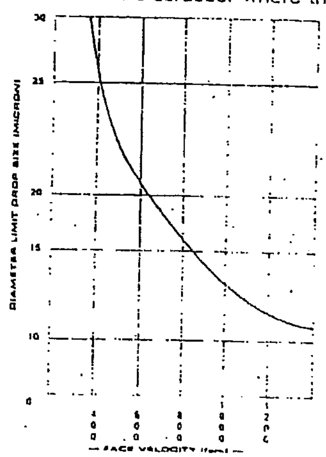
The more surface area that is wet, the more active surface is available for producing higher efficiency. The packing's other advantage results from a high void area and minimum blockage. Both are critical because having a high void area allows the liquid to cascade through the column with minimum effort and still be able to wet the whole packing structure. Blockage or channelling results when packing nests, causing areas to remain dry and provides open areas for contaminants to pass through. Dry areas will cause a loss of efficiency. Blockage also increases the static pressure of a column, and as static pressure increases, so do the energy requirements to move the air through the column.

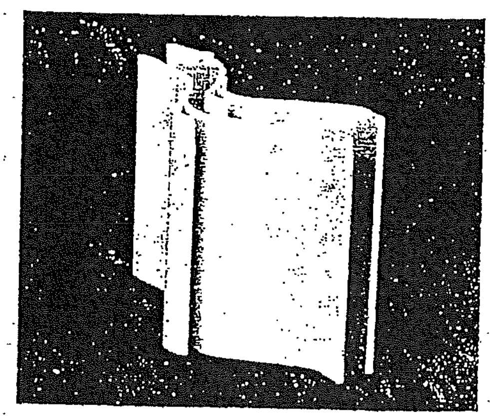


VIRON* MODEL VHE [illegible] OF BLADES

The VIRON* mist eliminator blade is an impingement-type separator designed for horizontal process gas flow. The blade is designed to operate with velocities from 400 to 1200 feet per minute. In this velocity range, droplet sizes of 13 micron and larger can be removed with an efficiency rate of up to 99.9 percent. The angular shape of the blade is arranged to provide a channel for the process gas to follow. The diagram below demonstrates how the process gas flows through the channels. The moisture-laden air is then pushed through a series of zig-zag patterns. Since the moisture cannot follow the deflections of the multiblend course, the pressure of the air flow forces the moisture against the walls of the chevron shaped blades. As more moisture is forced against the walls, water droplets form. As these droplets become larger, they begin to drop down toward the bottom of the scrubber through low velocity zones designed into the blade. After the droplets fall from the blade, they return to the bottom of the scrubber where they are collected.







SCRUBBER EFFICIENCY

CONTAMINANT CHEMICAL NAME	CHEMCIAL FORMULA	2" PACK 4GPM	5" PACK 8GPM
Acetic Acid	CH_3COOH	85	98
Acetone	CH_3COCH_2	85	98
Aluminum Chloride	$AlCl_3$	50	80
Aluminum Flouride	AlF_3	50	80
Ammonium Acetate	$NH_4(C_2H_3O_2)$	85	98
Ammonia	NH_3	70	99
Ammonium Hydroxide	NH_4OH	85	98
Ammonium Nitrate	NH_4NO_3	85	99
Ammonium Phosphate	$(NH_4)_2HPO_4$	70	99
Ammonium Sulfate	$(NH_4)_2SO_4$	80	98
Aniline	$C_6H_5NH_2$	85	98
Barium Chloride	$BaCl_2$	50	80
Barium Sulfate **	$BaSO_4$	85	98
Boric Acid	H_3BO_3	85	97
Bromine	Br	85	97
Calcium Chloride	$CaCl_2$	85	98
Calcium Hydroxide ***	$Ca(OH)_2$	85	99
Calcium Nitrate	$Ca(NO_3)_2$	80	98
Carbon Dioxide	CO_2	85	99
Carbon Disulfide	CS_2	80	90
Caustic Soda	NaOH	85	98
Chlorine *	Cl	75	98
Chlorine Dioxide	ClO_2	85	97
Chromic Acid	CrO_3	85	99
Chromium Ammonium Sulfate	$CrNH_4(SO_4)_2$	85	97
Chromium Potassium Sulfate	$CrK(SO_4)_2$	85	97
Cupric Chloride	$CuCl_2$	50	80
Diglycolic Acid	$O(CH_2COOH)_2$	97	99
Disodium Phosphate	Na_2HPO_4	97	99
Ethyl Alcohol	C_2H_5OH	90	99
Ethylene Glycol	CH_2OHCH_2OH	97	99
Ferric Nitrate	$Fe(NO_3)_3$	85	99
Ferrous Chloride	$FeCl_2$	50	80
Fluoroboric Acid	HBF_2	70	97
Fluosilicic Acid	$H_2S_1F_6$	85	99
Glycerin Glycerol	$C_3H_5(OH)_3$	85	99
Glycolic Acid (Hydroxyacetic)	$CH_2OHCOOH$	85	99
Hydrochloric Acid	HCl	85	99
Hydrofluoric Acid	HF	90	99
Hydro-Fluosilicic Acid	$H_2S_1F_6$	90	99
Hydroxy-Lamine Sulfate	NH_2OH	90	99
Hydrogen Bromide	HBr	85	98
Hydrogen Peroxide	H_2O_2	70	99
Hydrogen Sulfide *	H_2S	80	98
Lactic Acid	$CH_3CHOHCOOH$	90	99
Lead Acetate	$P_6(C_2H_3O_2)_2$	80	98
Lithium Chloride	LiCl	70	97
Magnesium Chloride	$MgCl_2$	70	99
Magnesium Hydroxide ***	$Mg(OH)_2$	85	98
Magnesium Sulfate	$MgSO_4$	80	98
Maleic Acid	HOOCCH:CHCOOH	97	99
Mercuric Chloride	$HgCl_2$	70	99
Nickel Chloride	$NiCl_2$	85	98
Nickel Sulfate	$NiSO_4$	70	99
Nitric Acid *	HNO_3	70	97
Nitrogen Oxide *	N_2O	70	97
Nitrogen Dioxide *	$NO(NO)_2$	70	97
Perchloric Acid	$HClO_4$	97	99
Phosgene	$COCl_2$	50	80
Phosphoric Acid	H_3PO_4	97	99
Potassium Bromide	KBr	70	97
Potassium Chloride	KCl	50	80
Potassium Dichromate	$K_2Cr_2O_7$	50	80
Potassium Fluoride	KF	70	97
Potassium Nitrate	KNO_3	70	97
Selenium Sulfide *	SeS	97	99
Sodium Chloride	NaCl	50	80
Sodium Flouride	NaF	50	80
Sodium Hydroxide	NaOH	85	98
Sulfur Dioxide *	SO_2	60	90
Sulfuric Acid	H_2SO_4	97	99
Tin Chloride (Stannic Chloride)	Na_2SnCl_6	90	99
Trichoro- Acetic Acid	CCl_3COOH	85	98
Trisodium Phosphate	Na_2HPO_4	70	99
Urea	$CP(NH_2)_2$	80	98
Zinc Chloride	$ZnCl_2$	90	99
Zinc Nitrate	$Zn(NO_3)_2$	90	99
Zinc Sulfate	$ZnSO_4$	85	98

* *Recommended neutralizing agent added to the recirculation system (Caustic Soda NaOH) with a pH 10 or higher.*

** *Recommended neutralizing agent added to the recirculation system (Sulfuric Acid H_2SO_4).*

*** *Recommended neutralizing agent added to the recirculation system (Ammonium Chloride NH_4Cl).*

5

TECH DATA SHEET

FIBERGLASS PACKED TOWER SCRUBBERS

HARRINGTON
INDUSTRIAL PLASTICS, INC.

168 FREEDOM AVENUE
ANAHEIM, CALIFORNIA 92801
(714) 879-9030

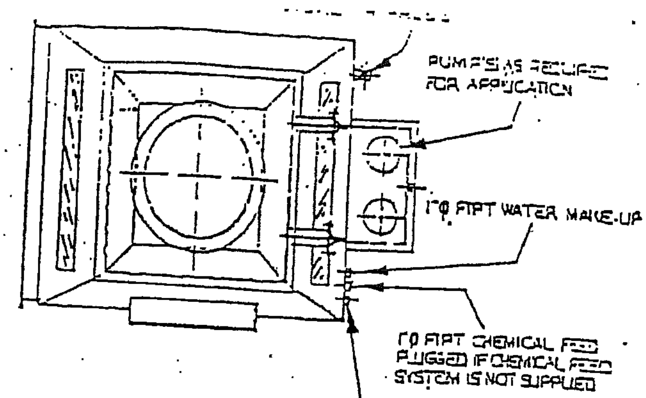
FUME SCRUBBER

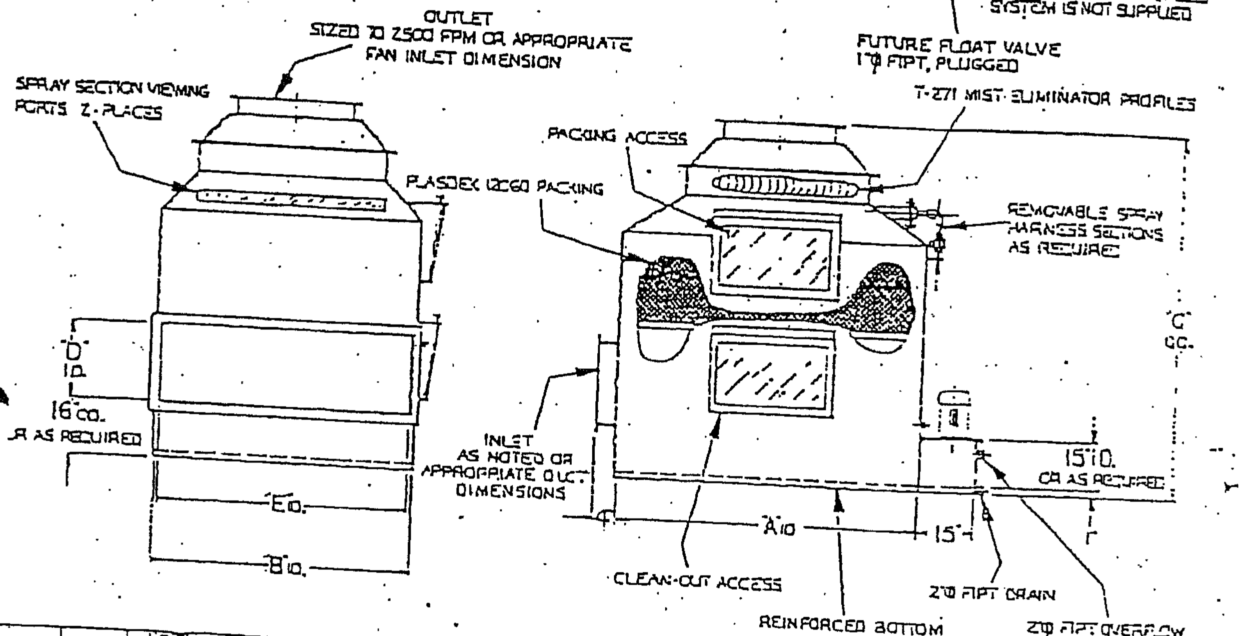
STANDARD HPV SERIES

FOR REFERENCE ONLY. REQUEST CERTIFIED DRAWINGS FOR CONSTRUCTION PURPOSES

NOTE:

TYPICAL MODEL NUMBER INDICATES SCRUBBER SIZE. EXAMPLE: HPV 33-3 IS A VERTICAL UNIT WITH A CROSS-SECTION OF 36" X 36" (A BY B DIMENSION) AND A 3' PACKED SECTION.





A	B	ACTUAL FACE AREA FT²	C				D	E	PUMPS		CFM			
			2' PACK	3' PACK	4' PACK	5' PACK			HP	REQ'D.	333 FPM	444 FPM	555 FPM	666 FPM
12	12	.67	90	102	114	126	6	10	1/2	1	223	297	372	446
12	24	1.33	90	102	114	126	6	22	1/2	1	443	590	738	886
24	24	333	90	102	114	126	6	22	1/2	1	1109	1478	1848	2216
24	36	500	90	102	114	126	6	34	3/4	1	1665	2220	2775	3330
36	36	800	94	106	118	130	10	34	1 1/2	1	2664	3552	4440	5328
36	48	1067	94	106	118	130	10	46	1 1/2	1	3553	4737	5922	7106
48	48	1467	98	110	122	134	14	46	1 1/2	1	4885	6514	8142	9770
48	60	1833	98	110	122	134	14	58	2	1	6104	8138	10173	12207
60	60	2333	102	114	126	138	18	58	3	1	7769	10358	12948	15538
60	72	2900	102	114	126	138	18	70	1 1/2	2	9324	12432	15540	18648
72	72	3400	106	118	130	142	22	70	2	2	11322	15096	18870	22644
72	84	3967	106	118	130	142	22	82	2	2	13210	17614	22017	26420
84	84	4667	110	122	134	146	26	82	3	2	15541	20721	25901	31082
84	96	5333	110	122	134	146	26	94	2	3	17759	23679	29598	35518
96	96	6133	114	126	138	150	30	94	2	3	20423	27231	34038	40844
96	108	6900	114	126	138	150	30	106	3	3	22977	30636	38295	45955
108	108	7800	118	130	142	154	34	106	7 1/2	1	25974	34632	43290	51945
108	120	8667	118	130	142	154	34	113	7 1/2	1	28851	38452	48102	57722
108	132	9667	122	134	146	158	38	115	7 1/2	1	32191	42922	53652	64382
108	144	10683	122	134	146	158	38	130	7 1/2	1	35408	47211	59013	[illegible]

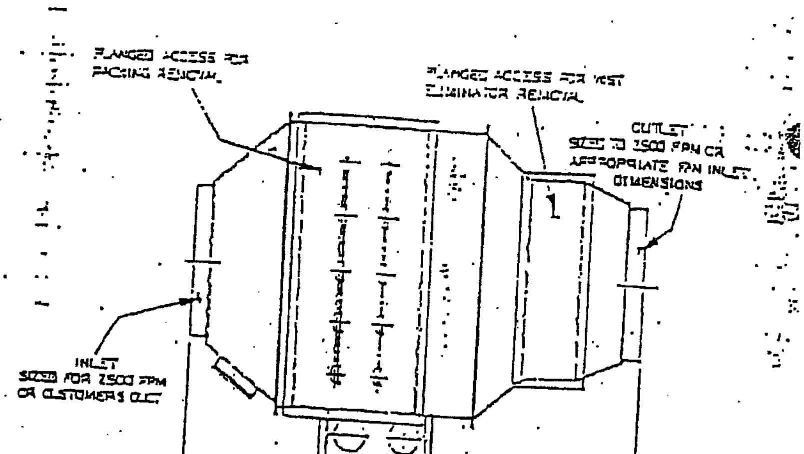
HARRINGTON HORIZONTAL FUME SCRUBBER

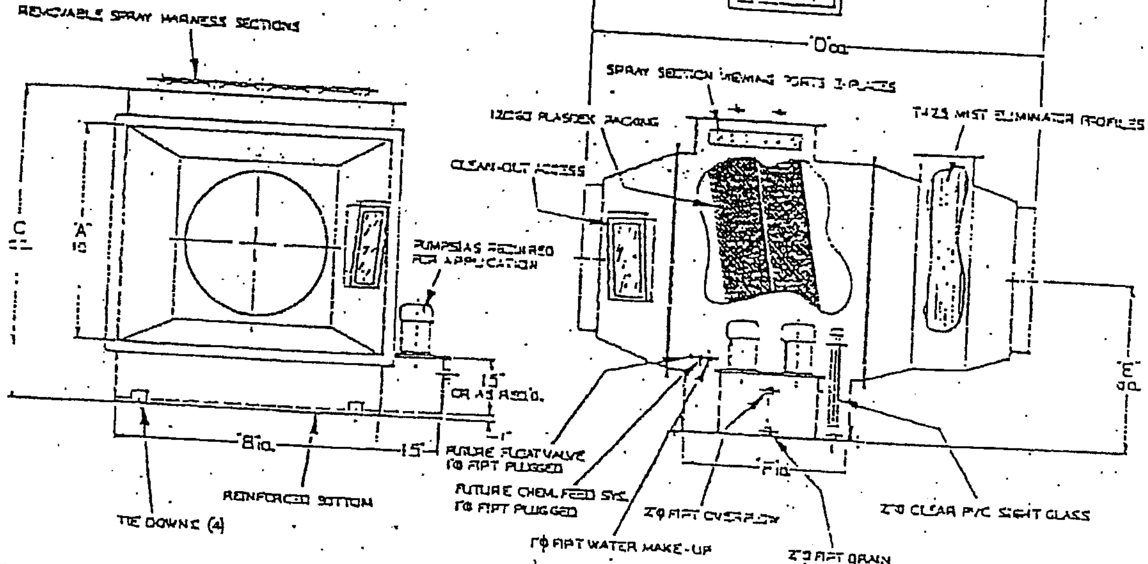
STANDARD HPH SERIES

FOR REFERENCE ONLY. REQUEST CERTIFIED DRAWINGS FOR CONSTRUCTION PURPOSES

NOTE:

TYPICAL MODEL NUMBER INDICATES SCRUBBER SIZE. EXAMPLE: HPH 33-3 IS A HORIZONTAL UNIT WITH A CROSS-SECTION OF 36" x 36" (A BY B DIMENSION) AND A 3' PACKED SECTION.





A	B	ACTUAL FACE AREA FT²	C	D				E	F				PUMPS		CFM			
				2' PACK	3' PACK	4' PACK	5' PACK		2' PACK	3' PACK	4' PACK	5' PACK	HP	REQ'D.	333 FPM	444 FPM	555 FPM	666 FPM
12	12	.67	36	101	113	125	137	22	31	43	55	67	1/2	1	223	297	372	446
12	24	1.33	36	101	113	125	137	22	31	43	55	67	1/2	1	443	590	738	886
24	24	3.33	48	103	115	127	139	29	33	45	57	69	1/2	1	1109	1478	1848	2218
24	36	5.00	48	103	115	127	139	28	33	45	57	69	3/4	1	1665	2220	2775	3330
36	36	8.00	60	105	117	129	141	34	35	47	59	71	1 1/2	1	2664	3552	4440	5328
36	48	10.67	60	105	117	129	141	34	35	47	59	71	1 1/2	1	3553	4737	5922	7106
48	42	14.67	72	107	119	131	143	40	37	49	61	73	1 1/2	1	4885	6514	8142	9770
42	60	19.33	72	107	119	131	143	40	37	49	61	73	2	1	6104	8138	10173	12207
60	60	23.33	84	101	113	125	137	46	39	51	63	75	3	1	7769	10358	12948	15538
60	72	29.00	84	101	113	125	137	46	39	51	63	75	1 1/2	1	9324	12432	15540	18648
72	72	34.00	96	103	115	127	139	52	41	53	65	77	2	2	11322	15096	18870	22644
72	84	39.67	96	103	115	127	139	52	41	53	65	77	2	2	13210	17614	22017	26420
84	24	46.67	108	105	117	129	141	58	43	55	67	79	3	2	15541	20721	25901	31082
84	96	53.33	108	105	117	129	141	58	43	55	67	79	2	2	17759	23679	29598	35518
96	96	61.33	120	107	119	131	143	64	45	57	69	81	2	3	20423	27231	34038	40846
96	108	69.00	120	107	119	131	143	64	45	57	69	81	3	3	22977	30636	38295	45955
108	108	78.00	132	109	121	133	145	70	47	59	71	83	7 1/2	3	25974	34632	43290	51948
108	120	85.67	132	109	121	133	145	70	47	59	71	83	7 1/2	1	29861	39482	48102	57722
120	120	93.37	144	111	123	135	147	76	49	61	73	85	7 1/2	1	33219	42922	53652	64382
120	132	105.33	144	111	123	135	147	76	49	61	73	85	7 1/2	1	35406	47211	59013	70816

4-21-82

HARRINGTON PLASTICS
STANDARD FEATURES

PS and HPV Series Packed Fume Scrubbers:

Herein listed are some of the unique advantages received when buying a Harrington Packed Fume Scrubber. The features listed are standard and not extra.

I. FIBERGLASS

1. 6693 FR Fire Retardant Exterior
2. VE8300 Vinylester Interior
   A. Resistant to caustics
3. Nexus Interior surfacing veil
   A. Resistant to Fluorides (HF)
4. Exterior gel with U.V. Inhibitor

II. CONSTRUCTION

1. Removable End Connectors (Transitions)
   A. Allow up to 5' packed bed on standard width truck for shipping
2. Bolted Access Panels
   A. For removal or access to packing and mist eliminators
3. Quick Opening Access Doors
   A. Slide type access panels constructed of clear PVC or Lexan
      1. Alleviate bolt type windows. and mastic which generally sticks to windows and breaks windows when trying to remove them.
4. Clear PVC viewing windows at spray section
   A. A window on each side so that light will shine through to facilitate inspection.
5. Encapsulated plywood bottom
   A. For additional rigidity during handling
6. Built-in strainer at recirculation sump
   A. To keep debris from clogging nozzles or damaging pumps
   B. Quickly removable for inspection or cleaning
7. Exterior Recirculation Piping, Accessable for maintenance
8. Tie Down Lugs (4)

III. STANDARD FEATURES

1. Vertical style sealess sump type recirculation pumps
   A. Sealess, run dry capability without harm
   B. CPVC Construction through 3 HP
   C. 316SS Construction 5 and 7½ HP
2. Multiple pumps when required alleviate 100% shut down due to unlikely event of pump malfunction
3. Recirculation piping, schedule 80 PVC
   A. All pipe branches incorporate Tru-Union PVC ball valves.
      1. Harness can be shut down and repaired without scrubber shut down
4. Non-clogging Bete spray nozzles (Polypro)

5. Additional piping hook-ups
   A. Fitting for chemical feed if required in the future
   B. Fitting for future float valve if desired
   C. Fitting for PH probe if required in future
6. Clear PVC stand pipe for sump level inspection

IV. ENERGY CONSERVING/EFFICIENT

1. Cross fluted PVC packing material
   A. High contact surface area
      1. 68 ft^2/ft^3
   B. Extremely low pressure drop per lineal foot of packing
      1. .05"W.C./Lineal foot
      2. Less HP required to exhaust air reflects directly to lower operating costs
   C. Unique design assures turbulent mixing of contaminant and recirculation liquid
   D. High efficiency allows for faster gas velocity
      1. Entire scrubber can be smaller in physical size
   E. Block style facilitates ease of removal & replacement if desired
   F. Open design reduces chance of clogging
2. Chevron type PVC mist eliminator
   A. Efficiency of 100% on mist down to 11 micron in size
   B. Low pressure drop across mist eliminator

V. DESIGNED WITH END USER IN MIND

1. Efficient
2. Energy Conserving
3. Ease of maintenance and accessibility
4. Future capabilities, installed today
5. Custom sizes, configurations and accessories available
6. Each scrubber has serial number kept on file at factory
7. Sized for transportability

VI. TESTS AND RESULTS

1. Harrington has in its factory in Anaheim, California, a complete scrubber test unit.
2. Independent laboratory tests are available on installed equipment.

COMPARISON OF PRESSURE DROP

Gas-2250#/HR/FT^2 (500 FPM Velocity)
Liquid-2000#/HR/FT^2 (4GPM/FT^2) Counter Current Flow

Packing Material	Available Surface Area/FT^3	Pressure Drop Foot of Packing
Harrington 12060	68 FT^2/FT^3	0.05" W.G.
1" Koch Flexirings	65	0.90"
1"Glitsch Ballast Saddles	65	0.80"
1"Glitsch Ballast Rings	65	1.30"
1" Intalox Saddles	63	0.75"
1" Norton Pall Rings	63	0.90"
1" Ceilcoat Tellerette	55	0.65"
2" Maspak FN-200	43	0.75"
1½" Rashig Rings	40	1.60"
1½"Glitsch Ballast Rings	40	0.84"
1½"Koch Flexirings	40	0.75"
1½"Norton Pall Ring	39	0.75"
2½"Protak P-251	39	1.00"
2" Ceilcoat Tellerette	38	0.30"
2"Koch Flexirings	35	0.45"
2"Protak P-252	34	0.82
2"Croil Reynolds Spiral-Pak	34	0.24"
2"Glitsch Ballast Saddles	34	0.55"
2"Intalox Saddles	33	0.50"
2"Glitsch Ballast Rings	32	0.55"
2"Norton Pall Rings	31	0.45"
2" Heilex 200	30	0.45"
3" Tellerettes	30	0.24"
2"Rashig Rings	30	1.40"
3½"Koch Flexirings	28	0.22"
3"Glitsch Ballast Saddles	28	0.32"
3"Intalox Saddles	27	0.30"
3½"Norton Pall Rings	26	0.22"
3½"Glitsch Ballast Rings	25	0.22"
3-3/4" Maspak FN-90	25	0.36" W.G.
3" Heilex 300	23	0.27" W.G.

CHEMICAL NAME	CHEMICAL FORMULA	MOLECULAR WEIGHT	1 PPM = mg/m³	mg/m³ = ppm	3' Pack 3 GPM	5' Pack 6 GPM
'cetic Acid	CH_3COOH	60.05	2.49	.40	85	98
... one	CH_3COCH_3	58.08	2.42	.41	85	98
Alkaline Cleaners	See Sodium Carbonate, Sodium Hydroxide				85	98
Alum, Chrome	See Chromium - Potassium Sulfate					
Alum, Chrome Ammonium	See Chromium - Ammonium Sulfate					
Aluminum * Bright Dip	See Metal Finishing List				70	97
Aluminum Chloride	$AlCl_3$	133.34	5.56	.18	50	80
Aluminum Flouride	AlF_3	101.99	4.25	.24	50	80
Ammonium Acetate	$NH_4(C_2H_3O_2)$	77.08	3.21	.31	85	98
...nia	NH_3	17.03	1.41	.71	70	99
Ammonium Hydroxide	NH_4OH	35.05	1.46	.68	85	98
Ammonium Nitrate	NH_4NO_3	80.05	3.34	.30	85	99
Ammonium Phosphate	$(NH_4)_2HPO_4$	132.07	5.50	.18	70	99
Ammonium Sulfate	$(NH_4)_2SO_4$	132.14	5.51	.18	80	98
Anodizing *	See Metal Finishing List					
Aniline ***	$C_6H_5NH_2$	163.25	6.80	.15	85	98
Aqua Regia *	See Metal Finishing List				70	97
Barium Chloride	$BaCl_2$	208.27	8.68	.12	50	80
...ium ** Sulfate	$BaSO_4$	233.42	9.73	.10	85	98

CHEMICAL NAME	CHEMICAL FORMULA	MOLECULAR WEIGHT	1 ppm = mg/m^3	mg/m^3 ppm	Approx. Efficiency @ 55 2' Pack 3 GPM	5' Pack 6 GPM
Boric Acid ***	H_3BO_3	61.84	2.58	.39	85	97
Bromine ***	BR	79.90	3.33	.30	85	97
Calcium Chloride	$CaCl_2$	110.99	4.62	.22	85	98
Calcium **** Hydroxide	$Ca(OH)_2$	74.10	3.09	.32	85	99
Calcium Nitrate	$Ca(NO_3)_2$	236.16	9.84	.10	80	98
Carbon Dioxide	CO_2	44.01	1.83	.55	85	99
Carbon *** Disulfide	CS_2	76.13	3.17	.32	80	90
Caustic Cleaners	See Metal Finishing List				85	98
Caustic Soda	NaOH	40.00	1.67	.60	85	98
Chlorine *	CL	70.91	2.95	.34	75	98
Chlorine Dioxide	ClO_2	67.45	2.81	.36	85	97
Chromic Acid	CrO_3	100.01	4.17	.24	85	99
Chromium Ammonium Sulfate	$CrNH_4(SO_4)_2$	956.72	39.87	.03	85	97
Chromium Potassium Sulfate	$CrK(SO_4)_2$	948.76	39.53	.03	85	97
Cupric Chloride	$CuCl_2$	134.48	5.60	.18	50	80
Cyanide Plating	See Metal Finishing List				90	99
Diglycolic Acid	$O(CH_2COOH)_2$	134.08	5.59	.18	97	99

CHEMICAL NAME	CHEMICAL FORMULA	MOLECULAR WEIGHT	1 ppm = mg/m^3	mg/m^3 ppm	Approx. Efficiency [illegible] 2' Pack 3 GPM	5' Pack 6 GPM
Sodium [illegible]ate	Na_2HPO_4	141.96	5.92	.17	97	99
Ethyl Alcohol	C_2H_5OH	46.07	1.92	.52	90	99
Ethylene Glycol	CH_2OHCH_2OH	62.07	2.59	.39	97	99
Ferric Nitrate	$Fe(NO_3)_3$	399.97	14.58	.07	85	99
Ferrous Chloride	$FeCl_2$	126.76	5.28	.19	50	80
Fluoroboric Acid	HBF_2	87.83	3.66	.27	70	97
Fluosilicic Acid	$H_2S_1F_6$	144.08	6.00	.17	85	99
[illegible]lycerin, [illegible]ol	$C_3H_5(OH)_3$	92.09	3.84	.26	85	99
Glycolic Acid (Hydroxy-acetic)	$CH_2OHCOOH$	76.05	3.17	.32	85	99
Hydrochloric Acid	HCL	36.47	1.52	.66	85	99
Hydrofluoric Acid	HF	20.01	.83	1.20	90–	99
Hydro – Fluosilicic Acid	$H_2S_1F_6$	144.08	6.00	.17	90	99
Hydroxy-Lamine Sulfate	NH_2OH	33.03	1.38	.73	90	99
Hydrogen Bromide	HBr	80.92	3.37	.30	85	98
[illegible]ogen [illegible]de	H_2O_2	34.02	1.42	.71	70	99

CHEMICAL NAME	CHEMICAL FORMULA	MOLECULAR WEIGHT	1 PPM = mg/m^3	mg/m^3 ppm	Approx. Efficiency @ 35 2' Pack 3 GPM	5' Pack 6 GPM
Hydrogen * Sulfide	H_2S	34.08	1.42	.71	80	98
Lactic Acid	$CH_3CHOHCOOH$	90.08	3.75	.27	90	99
Lead Acetate	$P_6(C_2H_3O_2)_2$	325.30	13.55	.07	80	98
Lithium Chloride	LiCl	42.40	1.77	.57	70	97
Magnesium Chloride	$MgCl_2$	95.23	3.97	.25	70	99
Magnesium**** Hydroxide	$Mg(OH)_2$	58.34	2.43	.41	85	98
Magnesium Sulfate	$MgSO_4$	120.38	5.02	.20	80	98
Maleic Acid	HOOCCH: CHCOOH	134.09	5.59	.18	97	99
Nickel Chloride	$NiCl_2$	129.60	5.40	.19	85	98
Nickel Sulfate	$NiSO_4$	154.75	6.45	.16	70	99
Nitric Acid	HNO_3	63.02	2.63	.38	70	97
Nitrogen * Oxide	N_2O	44.02	1.83	.55	70	97
Nitrogen * Dioxide	NO $(NO)_2$	30.01 60.02	1.25 2.50	.80 .40	70	97
Phosgene***	$COCl_2$	98.92	4.12	.24	50	80
Phosphoric Acid	H_3PO_4	98.00	4.08	.24	97	99
Potassium Bromide	KBr	119.01	4.96	.20	70	97
Potassium Chloride	KCl	74.56	3.11	.32	50	80

NAME	FORMULA	[illegible] WEIGHT	[illegible] mg/m^3	[illegible] ppm	[illegible] 3 GPM	[illegible] 6 GPM
Potassium ichromate	$K_2Cr_2O_7$	294.21	12.26	.08	50	80
P[illegible] loric Acid	$HClO_4$	100.46	4.19	.24	97	99
Potassium Fluoride	KF	58.10	2.42	.41	70	97
Potassium Nitrate	KNO_3	101.10	4.21	.24	70	97
Sodium Chloride	NaCl	58.45	2.44	.41	50	80
Sodium Fluoride	NaF	42.00	1.75	.57	50	80
Sodium Hydroxide	NaOH	40.00	1.67	.60	85	98
Sulfur * Dioxide	SO_2	64.06	2.67	.37	60	90
Sulfuric	H_2SO_4	98.08	4.09	.24	97	99
Tin Chloride (Stannic Chloride)	Na_2SnCl_6	260.53	10.86	.09	90	99
Trichoro-Acetic Acid	CCl_3COOH	163.40	6.81	.15	85	98
Trisodium Phosphate	Na_2HPO_4	141.96	5.92	.17	70	99
Urea	$CP(NH_2)_2$	60.06	2.50	.40	80	98
Zinc Chloride	$ZnCl_2$	136.29	5.68	.18	90	99
Zinc Nitrate	$Zn(NO_3)_2$	297.49	12.40	.08	90	99
Zinc Sulfate	$ZnSO_4$	161.44	6.73	.15	85	98

* Caustic

** H_2SO_4

*** Organic Solvents (Alcohol, Benzene, Toluene)

**** NH_4Cl

Calicote Air Pollution Control

FACSIMILE TRANSMITTAL NOTICE

FROM: CEILCOTE AIR POLLUTION CONTROL
P.O. Box 811630
Cleveland, OH 44181-1630
Telephone: (216) 243-0700, ext. 333
FAX: (216) 243-9854

CEILCOTE SENDER'S NAME: James W. Macdonald

TO: Mac Quinlan
COMPANY: Micron Semiconductor
FAX NUMBER: 208-362-3121

Date & time of transmittal: August 8, 1994 9:14 AM

Total number of pages, including this cover sheet - 1

Please Note: If you do not receive all pages of this transmission, please call (216) 243-0700 immediately.

MESSAGE

Subject: Scrubber, Fan, Pumps and Base Weights
Fab II

Reference: Your Fax Dated 7/27/94

Dear Mac;

I believe this is the same job which for which we have an inquiry. Based on this being the same the equipment would be our Scrubber Model HRP-67-48, Fan Model CLH2-4850 w/40 HP motor; two (2) recycle pumps and a steel skid.

The weights of the equipment would be as follows:

ITEM	DRY WEIGHTS	OPERATING WEIGHT
Scrubber HRP-67-48	3,500 Lbs.	10,000 Lbs.
Fan CLH2-4850 w/40 HP	2,400 Lbs.	2,400 Lbs.
Steel Skid	2,000 Lbs.	2,000 Lbs.
Two (2) Pumps & Piping	1,000 Lbs.	1,000 Lbs.
TOTAL WEIGHTS	9,000 Lbs.	15,800 Lbs.

These do not have a lot of slop included, so you may want to add some additional weights to this for your total structural weights for the roof. If you have any questions please let me know.

Sincerely,

Jim Macdonald

AUG 17 '94 13:41 CEILCOTE APC SALES PAGE.001

Ceilcote Air Pollution Control
Air-Cure Technologies, Inc.

ugust 8, 1994

PROPOSAL NO. C-17437

Micron Semiconductor, Inc.
2805 East Columbia Road
Boise, Idaho 83706-9698

Attention: Rebecca Foresee

Reference: RFQ #385846R1-B

We are pleased to submit our proposal for providing the above scrubber system per your request for quotation dated July 28, 1994 and your contact with our representative, Holbrook & Associates.

The scrubber system will consist of a crossflow scrubber with mounting skid, recycle pumps, recycle piping, fan, and miscellaneous instrumentation.

HORIZONTAL CROSSFLOW SCRUBBER

The proposed crossflow scrubber will be our Model HRP-67-48, 72" wide by 10' high by 16'-4" overall length including inlet and outlet transitions. The scrubber will have a capacity of 25,000 ACFM at 75°F and 3000 ft. elevation.

The scrubber will have a 4 foot deep bed of No. 2 Type K polypropylene Tellerette® packing. Material of construction will be dual laminate Dion 6693FR, Hetron 197 resin, reinforced with approximately 25% glass. The interior surface will include a corrosion resistant Nexus layer.

This unit will give a collection efficiency of 95% by weight of all gaseous Hydrogen Fluoride and Hydrochloric acid gases and 98% of all entrained liquid droplets 10 microns and larger. The pressure drop across the scrubber is approximately 1.75" W.C.

RECYCLE PUMPS

The recirculation pumps will be vertical centrifugal type constructed of FRP and manufactured by Fybroc or equal. Each pump will have a capacity of 144 GPM at 65' TDH. The pumps will be furnished complete with baseplate, coupling, coupling guard, mechanical seal and a 7.5 H.P., 3500 RPM, 230/460/3/60 High Efficiency TEFC motor. The pumps are non-overloading throughout the entire operating curve.

RECYCLE PIPING

The recycle piping will be of Schedule 80 PVC. The piping includes PVC valves to isolate the pumps and control the recirculation flow, and a pressure gauge and gauge guard. All piping will be preassembled and skid mounted in the shop.

P.O. Box [illegible] ■ Cleveland, [illegible] ■ [illegible] Fax [illegible]

FAN

The proposed fan will be our Model No. CLUB-4450 centrifugal having an impeller rated at 25,000 ACFM at 6" W.G. as manufactured by Ceilcote Air Pollution Control. All parts in contact with the airstream are constructed of solid fiberglass reinforced plastic using Hetron 197 resin. All metal parts are protected against corrosion. The fan will be statically and dynamically balanced at operating speed prior to shipment. The fan performance will be shop tested per AMCA. Please note Class IV construction is not required since you have not requested the shaft and impeller spin test. Class IV construction has been provided at your request as optional pricing.

Fan Model CLUB-4450

Performance: 25,000 ACFM, 6" SPWG, 957 RPM, 29.77 BHP
Class III Construction, Arrangement 1-E
Optional - Class IV Construction

Accessories: Housing Drain
Access Door
Motor and Drive Canopy
Round/Drilled Inlet Flange
Rectangular/Drilled Outlet Flange
AISI 416 S.S. Shaft
Nexus Corrosion Resistant Interior
Spring Vibration Isolators
Woods or Gurbing Motor Base
EPDM Inlet Flanged Flex Connector

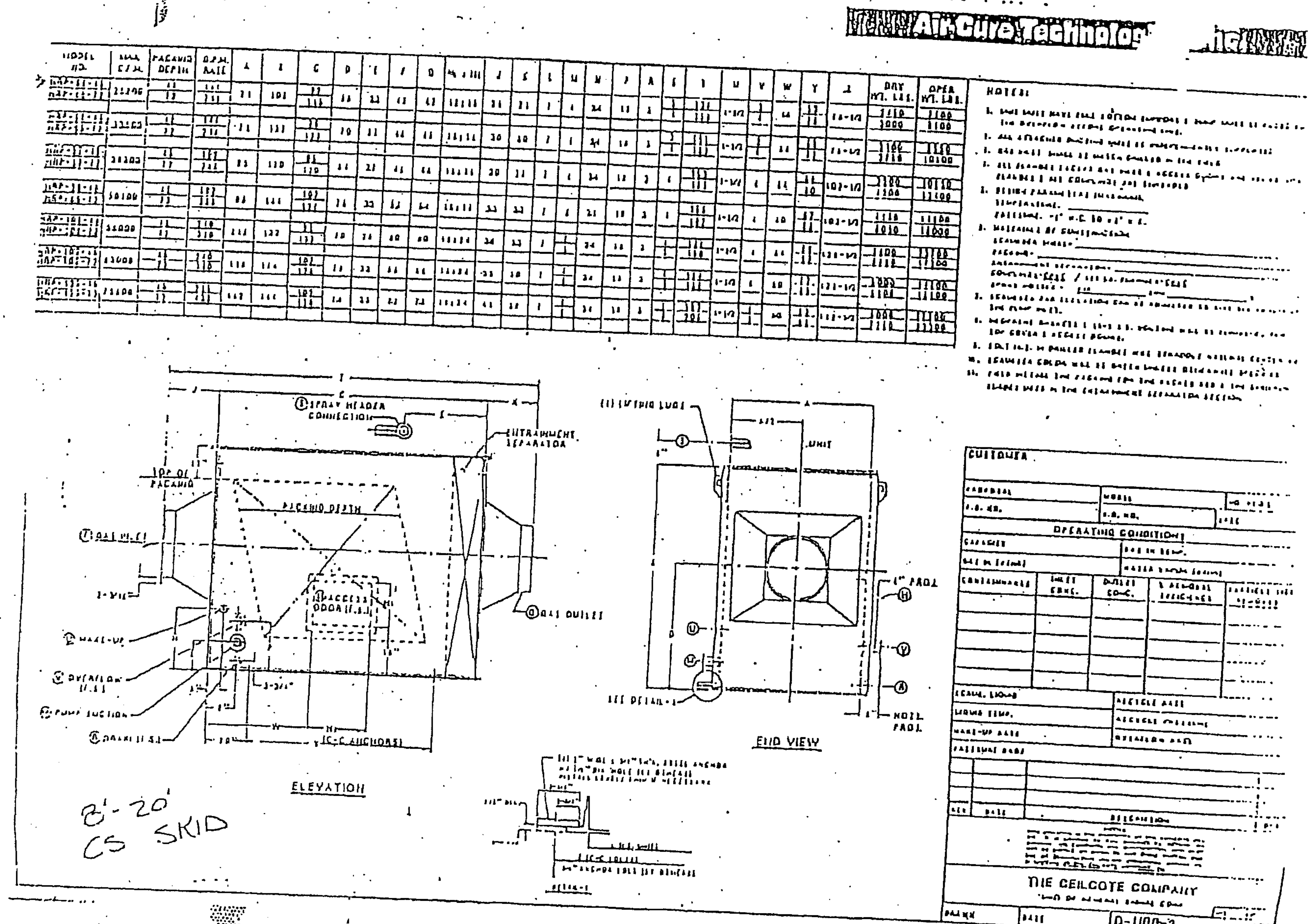
Motor: 40 H.P., 1800 RPM, 324T Frame
230/460/3/60, TEFC High Efficiency Enclosure

Drive: Fixed, V-Belt

INSTRUMENTATION

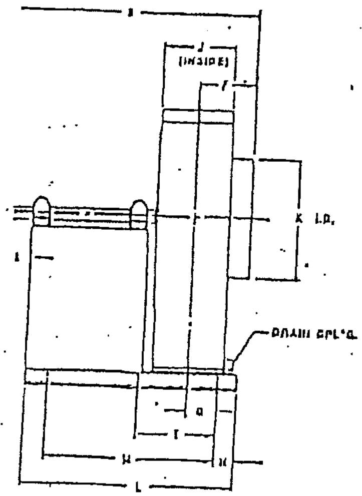
The following instrumentation is included with each system:

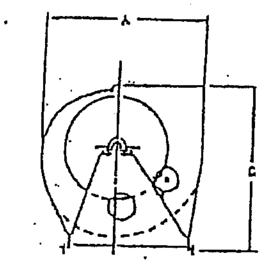
One	(1)	Kruger and Eckels pH Probe and Controller
One	(1)	Dwyer Photohelic Differential Gauge/Switch
One	(1)	Fluid Services Rotometer
One	(1)	Ashcroft Pressure Gauge


AirCure Technologies
MODEL NO.
DRY WT. LBS.
OPER. WT. LBS.
NOTES:
SPRAY HEADER CONNECTION
ENTRAINMENT SEPARATOR
PACKING DEPTH
GAS INLET
GAS OUTLET
ACCESS DOOR
MAKE-UP
OVERFLOW
PUMP SUCTION
DRAIN
C-C ANCHORS
ELEVATION
LIFTING LUGS
UNIT
END VIEW
CUSTOMER
OPERATING CONDITIONS
THE CEILCOTE COMPANY
D-100-7

8'-20'
CS SKID

K	L	M	N	O	P	R	S	T	U	V	W	Y	Z	DRAIN SIZE
30	53	37	8	40	39	15	6	18 1/2	3/4	·	1 15/16	-	21 11/16	1"
36	61 1/2	45 1/2	8	48	46	18	6	22 1/4	3/4	–	2 7/16	-	25 [illegible]	1"
42	70	54	8	56	55 1/2	21	6	27	3/4	–	2 7/16	-	31 3/16	1"
48	75 1/2	59 1/2	8	36	63 1/2	24	8	29 3/4	7/8	–	3 7/16	-	35 1/2	1"
60	86	70	9	74	71 1/2	22	8	35	7/8	-	3 7/16	-	43 1/2	1 1/2"





AUXILIARY VIEW
(CCW ROTATION)

FAN SPECIFICATIONS

FAN MODEL NO.
NO. OF FANS REQD.
ROTATION
CONSTRUCTION
MATERIAL
COLOR
CFM | RPM

	ACTUAL	STD. (70° F.)
TEMPERATURE	W.B. / D.B.	
AIR DENSITY		
STATIC PRESS.		
BHP		

FAN ACCESSORIES

INLET FLANGE | OUTLET FLANGE
FLANGE DRILLING | INLET | OUTLET
FLEX. CONNECTOR | INLET | OUTLET
SHAFT MATERIAL
SHAFT SEAL
GUARD: | BELT | SHAFT
MTR. & DR. CANOPY
ACCESS DOOR
INT'G. DISCH. TRANS. | TYPE 1 | TYPE 2
FLG'D. DISCH. TRANS. | TYPE 3 | TYPE 4
TRANS. DRILLING | INLET | OUTLET
TRANS. ATTACHMENT BOLTING
MOTOR RAILS
DRIVE
VIBRATION MOUNTS

MOTOR SPEC.	STANDARDS
HP	INLET FLG. F-1
RPM	OUTLET FLG. F-2
FRAME SIZE	TRANSITIONS T-1
VOLTAGE	
PHASE	NON-STD. ITEMS
CYCLE	
ENCLOSURE	
WEIGHT	

PRELIMINARY

	NOT APPROVED FOR FABRICATION	
	APPROVED FOR FABRICATION	
DISP.	DRAWING STATUS	DATE

... SHOWN
... OCKWISE ROTATION)

... INCHES.
... TATIONS ARE VIEWED FROM THE
... IONS ARE SUBJECT TO CHANGE
... 10 H.P. MOTOR OR LARGER.

CUSTOMER
P.O. NO.
TAG NO.
F.O. NO. | S.O. NO.

CLUB - SERIES FANS
ARRANGEMENT 9 | UP BLAST

THE CEILCOTE COMPANY
140 SHELDON ROAD
BEREA (CLEVELAND), OHIO

DFT.	CHK.	DRAWING NO.	REV.
DATE	DATE		

REV. 2/85

SPT SCRUBBER

Model No.: SPT-132-48 S.O. No.: 1689

Drawing No.: D-1689-01 P.O. No.: 5385847

DESIGN SPECIFICATIONS

Pressure: -6" WC Temperature: 180°F

Material (Corrosion Barrier): Hetron 197 w/ Nexus Int.

Material (Shell): Dion Corres 6693 FR w/ 5% Sb_2O_3

Specification: PS-15-69

Color: GLS Green No: G-285 w/ UV Inhibitor

Construction: Contact Molded (Hand Lay-up)

Contaminant	Inlet Conc. (1)	Outlet Conc. (2)	Removal Efficiency	Particle Size Removed
1. HCl (Gaseous)	100 ppm	5 ppm	95	
2. HF (Gaseous)	100 ppm	5 ppm	95	
3. HCl/HF (Mist)			98%	> 10 Microns
4. Mists			98%	> 10 Microns

OPERATING CONDITIONS

Capacity: 60000 ACFM (241,200 lb./hr)

Gas Inlet Temp.: 70°F Pressure: -4.5 "WC Pressure Drop: 2 "WC

Scrubbing Liquid: Water Recirculation Liquid Temp: 70°F

Recirculation Rate: 570 GPM Make-up and Overflow Rate: 30 GPM

SPRAY NOZZLE

Type: NCM40477W Capacity: 570 GPM at 10 psig

SCRUBBER WEIGHT

Shipping (Dry): 5000 lb. Operating (Wet): 21000 lb.

(1) - Inlet Concentration is assumed when not given.
(2) - Outlet concentration is based on maximum inlet concentration.

HRP SCRUBBER

Model No.: HRP-67-48 S.O. No.: 1750 P.O. No.: 385846

No. Units: 2 Drawing No.: D-1750-04 & -01

DESIGN SPECIFICATIONS

Pressure: -6.25" WC Temperature: 140°F

Material (Corrosion Barrier): Hetron 197 w/ Nexus Inc.
Material (Shell): Dion Corres 6693 FR w/ 5% Sb_2O_3

Specification: PS-15-69 Construction: Contact Molded (Hand Lay-up)

Color: GLS Green No: G-285 w/ UV Inhibitor

Contaminant	Inlet Conc. (1)	Outlet Conc. (2)	Removal Efficiency	Particle Size Removed
1. HCl (Gaseous)	100 ppm	5 ppm	95	
2. HF (Gaseous)	100 ppm	5 ppm	95	
3. HCl/HF (Mist)			98%	> 10 Microns
4. Mists			98%	> 10 Microns

OPERATING CONDITIONS

Capacity: 25000 ACFM (112,500 lb./hr)

Gas Inlet Temp.: 75°F Pressure: -4.5 "WC Pressure Drop: 2 "WC

Scrubbing Liquid: Water Recirculation Liquid Temp: 75°F

Recirculation Rate: 144 GPM Make-up and Overflow Rate: 14 GPM

SPRAY NOZZLE

Type: NCM1520Wsq Capacity: 24 GPM at 10 psig

SCRUBBER WEIGHT (without Skid)

Shipping (Dry): 3000 lb. Operating (Wet): 8500 lb.

SCRUBBER WEIGHT (with Skid)

Shipping (Dry): 5000 lb. Operating (Wet): 21000 lb.

(1) - Inlet Concentration is assumed when not given.
(2) - Outlet concentration is based on maximum inlet concentration.

Zeol Rotor Concentrator Design Specification

16:00:58 25-May-94
Page 1

USA data entry only

Company:	Micron Technology		
Address:	2805 East Columbia Rd. M/	File:	micron1
City:	Boise		
State:	Idaho		
Zip:	83706-9698	Country:	US
Contact Person:	Mr. Pete Swanstrom	Fax:	'208 368 3121
Application:	Semiconductor Fab Exhaust	Phone:	'208 368 4137
Stream Identification:	~~Fab 3: 6,000 CFM~~ Future Exhaust Rate		

VOC stream data:

	English Units:		Metric Units:	
Solvent laden air: (SLA)	6,000	acfm	10,194	m3/h
Solvent load	23.10	lbs/hr	10.48	kg/hr
SLA temperature:	72	°F	22	°C
SLA inlet pressure	0.00	inch w.c.	0	mm WG
Dust load:	0.00	lbs/hr	0.00	kg/hr
Required VOC removal	98.5	%	98.5	%
Relative humidity:	50	% Rh	50	%
Auxiliary process fan:	-8	inch w.c.	-203.2	mm WG

VOC Composition:

	Normal %	High %	Low %	Molecular Wt.
Acetone	42.80			58.06
iso-Propanol	35.80			60.10
Ethyl Lactate	6.10			118.13
Methyl Propyl Ketone(2-pentano	13.70			86.13
Ethyl-3-ethoxypropionate(EEPA)	0.70			146.10
Butyl Acetate	0.20			116.16
Other High Boilers	0.70			125.00
Total:	100.00			67.50

General data at the proposed plant location:

Plant location:	Boise			
Plant elevation:	2838	feet	866	m
Operating hours:	8760	hours/year		

Utility data

Fuel cost:(Natural gas or propa	$1.00	/mill Btu	$0.95	/mill kJ
Electric power cost:	$0.026	/kWh		
Power supply:	480V/3P/60Hz			
Cooling water temp:	74	°F	23	°C

Munters Zeol *a Division of Munters Corporation*
79 Monroe Street, Amesbury MA 01913, phone (508) 388 2666, fax (508) 388 5553

MAY 26 '94 11:39 15083885553 PAGE.006

Munters Zeol Rotor Concentrator

25-May-94
Page 2

Design Summary:

Company:	**Micron Technology**
Location:	**Boise**
Application:	**Mr. Pete Swanstrom**
Stream Identification:	~~Fab 3 = 6,000 CFM~~ [redacted]

Zeol Rotor Concentrator: **1500**

Number of Rotors:	**2**			
Inlet concentration	**409**	ppm(v)	**1238**	mg/m3
Inlet airflow:	**6,000**	acfm	**72**	°F
Outlet airflow	**4,697**	scfm	**83**	°F
Regeneration flow	**671**	scfm	**356**	°F
Desorbate flow	**671**	scfm	**180**	°F
Desorbate Concentration	**3,233**	ppm(v)	**9.75**	g/m3
Rotor Removal Efficiency	**98.90**	%		
System pressure drop	**1.05**	inch WC	**26.71920676**	mm WC
Process cooling required	**None**	btu/hr	**None**	kJ/h
CW @15°F delta T	**None**	gpm	**None**	m3/hr
Concentrate Oxidizer:	**Thermal**			
Combustion Temperature:	**1400**	°F	**99.79**	% Efficiency
Calculated System Efficiency:	**98.70**	%		
Combined Outlet Concentration:	**5**	ppm(v)	**16**	mg/Nm3

Energy consumption:

Fuel Required:	**175,406**	btu/hr		
Fuel Cost:(LHV = 620btu per ft3	**$0.28**	/hr		
Pre-process Fans:	**11**	hp	**9**	kW
Process blower:	**0**	hp	**0**	kW
Cooling blower:	**1**	hp	**1**	kW
Desorbate blower:	**3**	hp	**2**	kW
Total Electric power:	**15**	hp	**11**	kW
Power Cost:	**$0.29**	/hr		
Operating Costs:	**$0.58**	/hr	**$5,039**	/year

Zeol Rotor Concentrator Specification:

Particulate Filter:	**Not Required**
Process Air Cooler:	**Not Required**
Rotor Concentrator Module:	**Standard**
Desorption Heater:	**Secondary Heat Exchanger**
Desorbate Oxidizer:	**Thermal**
Process Fan:	**Not Required**
Cooling Fan:	**Not Required**
Desorbate Fan:	**Included**
Pre-Process Fan(s):	**Included**

Munters Zeol ***a Division of Munters Corporation***
79 Monroe Street, Amesbury MA 01913, phone (508) 388 2666, fax (508) 388 5553

MAY 25 '94 11:40 15083885553 PAGE.007

Zeol Rotor Concentrator Design Specification

USA data entry only

14:00:44 15-Apr-96

Page 1

Company:	**Micron Technolgy, Inc.**
Address:	**2805 East Columbia Road**
City:	**Boise**
State:	**ID**
Zip:	**83706**
Contact Person:	**Bobbie Rice**
Application:	**Fab 3 Replacement**
Stream Identification:	**Semiconductor Fab Exhaust**

File:	**Micron6**
	ALternate 1
Country:	**USA**
Fax:	**208-368-5001**
Phone:	**208-368-4125**

VOC stream data:

	English Units:		Metric Units:	
Solvent laden air: (SLA)	**15,000**	acfm	**25,486**	m3/h
Solvent load	**20**	lbs/hr	**9.1**	kg/hr
SLA temperature:	**73**	°F	**23**	°C
SLA Pressure:	**0.00**	inch w.c.	**0**	mm WG
Dust load:	**0.10**	lbs/hr	**0.05**	kg/hr
Required VOC removal	**95**	%	**95**	%
Relative humidity:	**50**	% Rh	**50**	%
Auxiliary process fan:	**-5**	inch w.c.	**-127**	mm WG

VOC Composition:

	Normal %	High %	Low %	Molecular Wt.
Acetone	**40.00**			58.06
iso-Propanol	**35.00**			60.10
Methyl Propyl Ketone(2-pentanon	**14.00**			86.13
Ethyl Lactate	**6.00**			118.13
Ethyl-3-ethoxypropionate(EEPA)	**2.00**			146.10
Butyl Acetate	**1.00**			116.16
Other High Boilers	**2.00**			125.00
Total:	**100.00 %**			69.99

General data at the proposed plant location:

Plant location:	**Boise,Idaho**			
Plant elevation:	**2840**	feet	**866**	m
Operating hours:	**8760**	hours/year		

Utility data

Fuel cost:(Natural gas or propa	**$0.99**	/mill Btu	**$0.94**	/mill kJ
Electric power cost:	**$0.026**	/kWh		
Power supply:	**480V/3P/60Hz**			
1% Wet Bulb Temperature	**82**	°F	**28**	°C

Munters Zeol ***a Division of Munters Corporation***

79 Monroe Street, Amesbury MA 01913, phone (508) 388 2666, fax (508) 388 5553

Design Summary:

Company:	Micron Technolgy, Inc.			
Location:	Boise,Idaho			
Application:	Fab 3 Replacement			
Stream Identification:	Semiconductor Fab Exhaust			

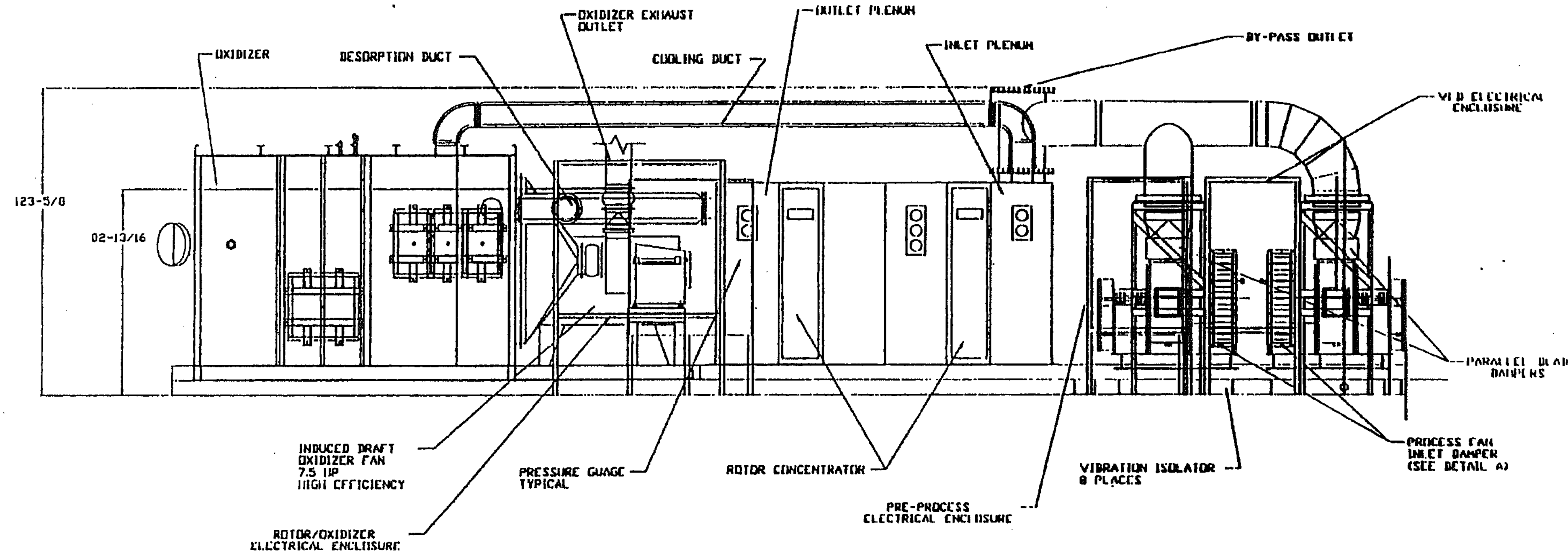
Zeol Rotor Concentrator:	2400			
Number of Rotors:	1			
Inlet concentration	137	ppm(v)	429	mg/m3
Inlet airflow:	15,000	acfm	73	°F
Outlet airflow	12,065	scfm	82	°F
Regeneration flow	1,339	scfm	356	°F
Desorbate flow	1,339	scfm	145	°F
Desorbate Concentration	1,369	ppm(v)	4.08	g/m3
Rotor Removal Efficiency	99.4	%		
System pressure drop	3.25	inch WC	82	mm WC
Process cooling required	None	btu/hr	None	kJ/h
CW @15°F delta T	None	gpm	None	m3/hr
Concentrate Oxidizer:	Thermal			
Combustion Temperature:	1400	°F	99.0	% Efficiency
Calculated System Efficiency:	98.5	%		
Combined Outlet Concentration:	2	ppm(v)	7	mg/Nm3

Energy consumption:				
Fuel Required:	549,363	btu/hr		
Fuel Cost: (1000 Btu/ft³)	$0.54	/hr		
Dual Process Fans	28	hp	21	kW
Process blower:	0	hp	0	kW
Cooling blower:	1	hp	1	kW
Desorbate blower:	3	hp	2	kW
Total Electric power:	32	hp	24	kW
Power Cost:	$0.62	/hr		
Operating Costs:	$1.16	/hr	$10,160	/year

Zeol Rotor Concentrator Specification:

Particulate Filter:	Included
Rotor Concentrator Module:	Standard
Desorption Heater:	Secondary Heat Exchanger
Desorbate Oxidizer:	Thermal
Process Fan	None
Cooling Fan:	Included
Desorbate Fan:	Included
Redundant Process Fan(s):	Included

Munters Zeol
a Division of Munters Corporation
79 Monroe Street, Amesbury MA 01913, phone (508) 388 2666, f a Division of Munters Corporation



SIDE ELEVATION

Appendix E: Hypothetical Boiler and Emergency Generators Emissions

Hypothetical Emissions from Existing Emergency Generators

UNIT	RATED CAPACITY	Fuel Use	Emissions (tons per year)				
CODE	(HP)	(gal/hr)	NOx	CO	SO2	PM10	VOC
EU2-GEN-04	1851	84	5.14	0.24	0.23	0.029	0.053
EU2-GEN-07	1851	84	5.14	0.24	0.23	0.029	0.053
EU2-GEN-06	1801	88	3.32	0.62	0.25	0.117	0.042
EU2-GEN-08	1801	88	3.32	0.62	0.25	0.117	0.042
EU2-GEN-03	1443	70	3.50	0.76	0.58	0.101	0.105
EU2-GEN-02	339	17	1.05	0.23	0.07	0.075	0.101
EU2-GEN-09	449	23	0.90	0.29	0.06	0.083	0.015
EU2-GEN-10	1826	93	3.25	1.19	0.74	0.085	0.163
EU2-GEN-11	1826	93	3.25	1.19	0.74	0.085	0.163
EU2-GEN-12	1826	93	3.25	1.19	0.74	0.085	0.163
EU2-GEN-13	1826	93	3.25	1.19	0.74	0.085	0.163
EU2-GEN-14	1826	93	3.25	1.19	0.74	0.085	0.163
EU2-GEN-18	1851	84	5.14	0.24	0.23	0.029	0.053
EU2-GEN-15	1826	93	3.25	1.19	0.74	0.085	0.163
EU2-GEN-16	1826	93	3.25	1.19	0.74	0.085	0.163
EU2-GEN-17	1851	84	5.14	0.24	0.23	0.029	0.053
EU2-GEN-19	1826	93	3.25	1.19	0.74	0.085	0.163
EU2-FWP-02	481	30	1.48	0.32	0.10	0.106	0.143
TOTAL EMISSIONS			60.14	13.31	8.15	1.39	1.96
Emission Factors							
> 600 horse power units in (g/hp-hr)							
AP-42 Factors[1]			11	2.4	1.835	0.3178	0.33
EU2-GEN-04, 07, 17, 18, and 22[6]			12.6	0.58	0.57	0.07	0.13
EU2-GEN-06 AND 08[6]			8.367	1.559	0.635	0.296	0.106
EU2-GEN-10, 11, 12, 13, 14, 15, 16 AND 19[6]			8.09	2.961		0.211	0.405
< 600 horse power units in (g/hp-hr)							
AP-42 Factors[5]			14	3.03	0.931	1	1.35
Factors for EU2-GEN-09[6]			9.08	2.9	0.605	0.842	0.156
Heat value #2 diesel		0.13986	MMBtu/gal				

1. Emission factors from AP-42, Section 3.4, Large Stationary Diesel and All Stationary Duel Fuel Engines. AP-42 factors used where manufacturer's emission factor data not available.
2. TPY = EF (G/HP-H) x RATED CAPACITY (HP) x HOURS OPERATED (H/YR) / 454 (G/LB) /2000 (LB/TON)
3. Emissions are based on 200 hours of operation
4. Emission factors AP-42, Section 3.3, Gasoline and Diesel Industrial Engines. AP-42 factors used where manufacturer's emission factor data not available.

Hypothetical Emissions from Existing Boilers

	Fuel Use (Btu/yr)	Annual Emissions (tons)				
		NOx	CO	SO2	PM10	VOC
Building 4						
Boiler 1	104,769,600	3.96	4.18	0.03	0.40	0.29
Boiler 2	104,769,600	3.96	4.18	0.03	0.40	0.29
Boiler 3	209,451,600	7.92	8.36	0.06	0.80	0.58
Boiler 4	209,451,600	7.92	8.36	0.06	0.80	0.58
Boiler 5	244,404,000	9.24	9.75	0.07	0.93	0.67
Boiler 6	244,404,000	9.24	9.75	0.07	0.93	0.67
Boiler 7	209,451,600	3.96	3.30	0.06	0.80	0.58
Building 25						
Boiler 1	209,451,600	7.92	8.36	0.06	0.80	0.58
Boiler 2	104,769,600	3.96	4.18	0.03	0.40	0.29
Boiler 3	104,769,600	3.96	4.18	0.03	0.40	0.29
Boiler 4	209,451,600	7.92	8.36	0.06	0.80	0.58
Boiler 5	209,451,600	7.92	8.36	0.06	0.80	0.58
Boiler 6	209,451,600	3.96	3.30	0.06	0.80	0.58
Boiler 7	209,451,600	3.96	3.30	0.06	0.80	0.58
Boiler 8	209,451,600	3.96	3.30	0.06	0.80	0.58
Boiler 9	209,451,600	3.96	3.30	0.06	0.80	0.58
Building 80						
Boiler 1	16,687,800	0.83	0.70	0.00	0.06	0.05
Boiler 2	16,687,800	0.83	0.70	0.00	0.06	0.05
Boiler 3	16,687,800	0.83	0.70	0.00	0.06	0.05
Boiler 4	16,687,800	0.83	0.70	0.00	0.06	0.05
Boiler 5	16,687,800	0.83	0.70	0.00	0.06	0.05
Boiler 6	16,687,800	0.83	0.70	0.00	0.06	0.05
Building 32						
Boiler 1	9,381,960	0.47	0.39	0.00	0.04	0.03
Total		99.17	99.10	0.90	11.83	8.56
Emission Factors[1]		7.20E-02	7.60E-02	6.00E-07	7.60E-06	5.50E-06
Emission Factors[2]		1.00E-04	8.40E-05			
Emission Factors[3]		3.60E-02	3.00E-02			
Heat Content[4]		1050	BTU/ft3			

1. PM10, SO2 and VOC emissions factors for building 4 and building 25 boilers are from AP-42, Section 1.4, for small industrial boilers (<100 MMBtu/hr) in units lb/ft3. NOx and CO emission factors are from Sellers Engineering Co. in units of lb/MMBtu.
2. All emission factors for Building 32 and Bld 80 boilers are from AP-42 Section 1.4 for Small Boilers (<100 MMBtu/hr) in units of lb/ft3
3. NOx emission factors for Bldg 4 boiler 7 and building 25 boilers 6,7,8, and 9 low NOx boilers from Sellers Engineering Co. in units of lb/MMBtu.

Cooling Towers

Manufacturer	Flow Rate[1]	TDS[2]	Drift Loss	PM10 Emissions	
	(gpm)	(ppm)	%	lb/yr	ton/yr
Marley[3]	10,400	750	0.02	6,838	3.42
PSI	70,000	750	0.008	18,411	9.21
CCT	15,000	750	0.005	2,466	1.23
Total Emissions				27,715	13.9
Density of water:	8.34	lb/gal			

1. These calculations assume maximum flow rate throughput the year for all towers
2. Water circulated through the cooling towers is maintained with a maximum total dissolved solids (TDS) concentration of 750 ppmw.
3. Four Marley towers located at Bldg 4 (4,500 gpm), two at Bldg 38 (2,300 gpm), and three at Bldg 6 (3,600 gpm)

Appendix F: Emission Factors for Natural Gas Fired Boilers and Diesel Emergency Generators and Non Contact Cooling Towers

SELLERS ENGINEERING COMPANY
PO Box 48, 918 W. Walnut St.
Danville, KY 40422
PH: (606) 236-3181
FAX: (606) 236-3184

TELECOPIER TRANSMITTAL SHEET

TO: Mike Keffner

COMPANY: Micron

TELECOPIER PHONE NUMBER: 208-368-3121

FROM: Terry Crowley

NO. OF PAGES TO FOLLOW-COVER SHEET: -0-

OPERATOR: TC

MEMO

Date: 12/12/94

Re: Mass Emission Rate - Sellers Boilers

Mike, The mass emission rate for Sellers Boilers for NOx & CO are as follows -

NOx - 60 ppm or .072 #/mm Btu
30 ppm = 0.036 #/mm Btu

CO - 100 ppm or .076 #/mm Btu
40 ppm = 0.030 #/mm Btu

Ref. at 3% O2

I hope this is helpful.

Terry Crowley

ATTN: KYAN MILLS

Immersion Boilers

SELLERS LOW NOx

SPECIFICATION SHEET NO

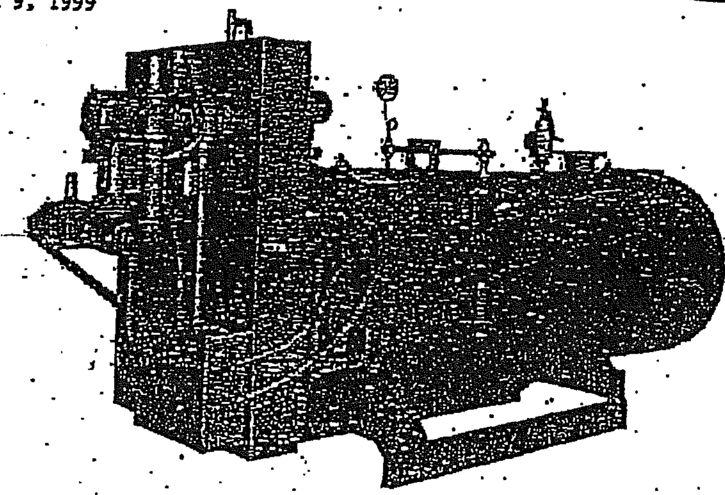
8300

JULY 1, 1992

Attachment B

MODEL LN390 IMMERSION FIRED STEAM BOILERS

Letter to Matt Stoll IDEQ April 9, 1999



GENERAL DESCRIPTION

The Sellers Model LN390 is a horizontal, single pass, firetube, immersion fired steam boiler designed to burn natural gas. The unique burner assembly delivers pre-mixed air and gas through multiple nozzles. The air-gas mixture is ignited as it exits each flame-retaining nozzle at high velocity. The resulting flames are long and small in diameter. The flame from each of these nozzles is directed into a 2" O.D. tube that is completely immersed in liquid. There is a separate tube for each flame with the same amount of heat going into each tube.

These long small-diameter flames burn in the first half of the tube lengths. Therefore, the "fire shines" on half of the heating surface in the single pass boiler - 50% of the total heating surface is radiant heating surface. The high percentage of radiant heating surface, the low heat input into each individual tube, and the even distribution of heat throughout the multiple tubes virtually eliminate thermal stress problems common in multiple pass boilers due to temperature differentials and high radiant heat transfer rates.

LOW NOx PERFORMANCE

The formation of oxides of nitrogen (NOx) in boilers is affected by the flame temperatures generated by the combustion process. Lower flame temperature will produce emissions with lower NOx content.

The Sellers Model LN390 boiler is perfectly suited to low NOx performance because of the multiple, pre-mix, high velocity flames and the immersion firing principle. Unlike firetube or watertube boilers with a single large flame firing into one large furnace, the immersion fired boiler has many small flames firing into many small diameter furnaces. No part of any flame in a Model LN390 boiler is ever more than one inch away from its cooling agent, the water. Low flame temperatures result from two techniques used:

- First, air and gas are thoroughly pre-mixed prior to the start of combustion.
- Second, the high velocity and close proximity of the flame to the heating surface promotes rapid transfer of heat from the flame to the liquid.

These factors keep NOx formation low. Flue gas recirculation (FGR), oxygen trim systems, flue gas treatment, or other reduction methods are not needed.

TESTED AND CERTIFIED

The Sellers model LN390 Low NOx Boiler has been tested and certified to produce oxides of nitrogen emissions of less than 30 PPM, referenced at 3% oxygen. Emissions testing was performed by an independent testing agency in accordance with EPA test method 7E using a chemiluminescent analyzer.

SELLERS ENGINEERING CO., MANUFACTURING STEAM AND HOT WATER BOILERS SINCE 1931.

-GKGPE1- TMI - ENGINE AND COMP PERF
09 - PACKAGE SET PERFORMANCE DATE: 09/2
3512B DI TA SC DRY MANF TURBO QTY 4 PARALLEL TIME: 09:4
DM1726-04 PGS STANDBY 60 HERTZ EXH STK DIA 8.0 IN ADEM GOV
GEN 1400.0 W/F EKW 1445.0 W/O F EKW W/F BHP 2032 W/O F BHP @ 1800
EMISSIONS STRATEGY A/C TEMP: DEG F 140
INFO CODE 05 - EMISSIONS DATA * * * * * RATED SPEED * * * * STANDARD TIMI
"NOT TO EXCEED DATA"

GEN PWR EKW	% LOAD	ENG PWR BHP	NOX (AS NO2)	CO	TOTAL HC	PART MATTER	O2 (DRY) IN EXH (VOL) %	SMOKE OPAC %	B S
			* * * * * * *	* * *	LB/HR * * * * *	* * * * *			
1400.0	100	2025.4	32.55	11.92	1.63	.850	10.40	2.3	
1050.0	75	1530.9	24.03	10.08	1.36	.630	11.60	2.0	
700.0	50	1042.5	19.27	7.53	1.01	.450	12.50	1.9	
350.0	25	561.0	12.71	6.55	.86	.350	13.80	2.2	
140.0	10	262.6	8.08	5.97	1.10	.300	15.70	2.3	

use emission for 1400 kW (conservative)

1250 DFLC

ONAN GENERATOR SET

EXHAUST EMISSIONS DATA SHEET

Onan

ENGINE

Model: Cummins KTA50-G3

Type: 4 cycle, 60 °V 16 Cylinder Diesel

Aspiration: Turbocharged and Aftercooled

Compression Ratio: 13.9:1

Emissions Control Device: Turbocharged and Aftercooled, with Variable Timing

Bore: 6.25 in. (159 mm)

Stroke: 6.25 in. (159 mm)

Displacement: 3067 cu. in. (50.3 liter

PERFORMANCE DATA *	STANDBY	PRIME
BHP @ 1800 RPM (60 Hz)	1850	1635
Fuel Consumption (gal/Hr)	84.0	74.5
Air to Fuel Ratio	26.5	26.3
Exhaust Gas Flow (CFM)	9620	8845
Exhaust Gas Temperature (°F)	905	885

* The performance and emissions data shown here correspond to the maximum available engine power, and may not coincide with the operating data shown in the Generator Set Specification Sheet.

EXHAUST EMISSIONS DATA

(All values are grams/HP – Hour @ max BH

COMPONENT	STANDBY	PRIME
HC (Total Unburned Hydrocarbons)	0.13	0.17
NO_X (Oxides of Nitrogen as NO_2)	12.60	11.70
CO (Carbon Monoxide)	0.58	0.61
PM (Particulate Matter)	0.07	0.08
SO_2 (Sulfur Dioxide)	0.57	0.57
CO_2 (Carbon Dioxide)	470	470
N_2 (Nitrogen)	3000	3100
O_2 (Oxygen)	410	460
H_2O (Water Vapor)	170	170

TEST CONDITIONS

Data was recorded during steady–state rated engine speed (± 25 RPM) with full load (± 2%). Pressures, temperatures and emission rates were stabilized.

Fuel Specification:	ASTM D975 No. 2–D diesel fuel with 0.2% sulfur content (by weight) and 42–50 cetane number.
Fuel Temperature:	99 °F ± 9 ° (at fuel pump inlet)
Intake Air Temperature:	77 °F ± 9 °
Barometric Pressure:	29.6 in. Hg ± 1 in.
Humidity:	NO_X measurement corrected to 75 grains H_2O / lb dry air

The HC, NO_x and CO emissions data tabulated here were taken from a single engine under the test conditions shown above. Data for components are estimates. This data is subject to instrumentation, measurement and engine–to–engine variability. Engine operation w excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emissi

EDS

Dec – 91

Specifications May Change Without Notice.

Onan Corporation 1400 73rd Avenue N. E. Minneapolis, MN 55432 (612) 574–500

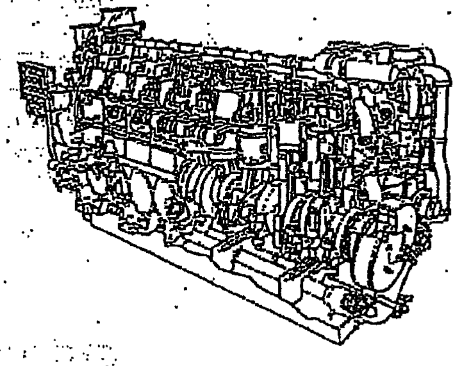
Injection
4.0 (10
8.0
6.5
165
24
35
0.002
1280
1800
1800
50
45
/–0.25
1792.4
N.A.
OWER 50 hz
1500
725 - 775
1470 (1097)
253 (1744)
1562 (7.9)
155 (116)
440 (27.8)
400 (25.2)
1275 (1546)
935 (502)
1965 (4231)
1705 (153)
1750 (646)
1250 (654)
is engine.

KTA50-G3
25-893
September, 1993

Wheeler
POWER SYSTEMS

4901 West 2100 South • Salt Lake City, Utah 84120 • 801-978-1541

From the desk of Merlin Barnhurst
Project Manager Fax # 801-978-1550



To: Micron

Attn: Martin Bower

Fax: 208-368-5555

Date: February 27, 2003

Re: 3406 s/n 4RG02560 Emissions Data

Pages: 2

Message

Martin,

I apologize for the delays in getting this data for you. I have no explanation as to why it was not available in the system, but I am happy that my counterparts at Caterpillar knew where to find it.

Please review the attached information and let me know if you have any questions.

I hope that this information helps. Please feel free to call me with any questions that you may have.

Thank you,

Merlin

Merlin Barnhurst

SCOPE:

Demolish old tower and furnish new cooling tower FRP structure and internal material equipment and appurtenances required for a complete composite structured cooling tower per CCT proposal GH-D-0020. Scope of supply includes the following additional services:

a) Field Technical Supervision
b) Labor to demolish and erect new tower structures and internals with piping and electrical wiring.
c) Rental equipment required to erect and install tower and all related equipment.
d) Stainless Steel Basin and HDG support structure
e) Project Engineering Services

Ref.: CCT Drawings: PJ00271-S1, S2, S3
Specification Section: PCS-#3527

SPECIFICATIONS: UNILITE MODEL NO 5-ULL-1622-60-12P4 FM

a) Cell Dimensions L x W (Ft) 16'-0" x 22'-4"
b) Number of Towers 1
c) Number of Cells 5
d) Total GPM 15000
e) GPM Per Cell 3000
f) Fan Diameter 12'
g) Fan Pitch 13.7
h) HWT 90 F
i) CWT 80 F
j) WBT 72 F
k) Evaporation Loss at Design 1.0 % of total water flow
l) Drift Loss .005% of Total Flow.
m) Tower Pumping Head 19 ft. from top of basin lip.

NOTE: The Tower Pump Head represents static pressure from the bottom of the basin to centerline of the Inlet pipe plus normal nozzle operating pressure. It is the responsibility of others to calculate the final required pump head for the piping system to the cooling tower.

STRUCTURE – FM Approved

The cooling tower casing, fan shroud, fan deck, beams, columns, supports and partition walls shall be constructed of corrosion resistant, fire retardant, self-extinguishing glass reinforced polyester resin with a flame spread rating of 25 or less per ASTM E-84 tunnel test. The wall sections will be double wall construction.

dizing not only the cooling tower, but the heat exchanger and all other water circuit related components as well.

The proper me..od for controlling TDS concentrations is ..alled "blowdown", where a portion of the circ...ting water flow (along with its TDS burden) is continuously ...sted and replenished with relatively pure make-up water.

The approximate level to which contaminants can concentrate in the circulating water is determined by the following formula:

$$C = \frac{E + D + B}{D + B} \qquad (2)$$

Where: E = Rate of evaporation; gpm (If not accurately known, evaporation can be approximated by multiplying total water flow rate in gpm times the cooling range (°F) times 0.0008) . (3)

D = Rate of drift loss; gpm (If not accurately known, drift rate can be approximated by multiplying total water flow rate in gpm times 0.0002) (4)

B = Rate of blowdown; gpm

However, because an acceptable level of concentration has usually been predetermined, the operator is more concerned with the amount of blowdown necessary to maintain that concentration, and the following transposition of Form... (2) is used:

$$B = \frac{E - [(C-1) \times D]}{(C-1)}$$

For example, let us assume that a given cooli... tower is designed to reduce the incoming temp... ature of 10,000 gpm by 25°F (range). Let us furth... assume that the level of chlorides in the make-... water is 250 ppm, and we do not want that level ... go beyond 750 ppm in the circulating water. A... lowable concentrations are 750/250 = 3. The a... proximate evaporation rate would be 10,000 × 2... × 0.0008 = 200 gpm. The approximate drift rat... would be 10,000 × 0.0002 = 2 gpm. Applyin... these values to Formula (5), blowdown would be

$$\frac{200-[(3-1)\times 2]}{(3-1)} = \frac{200-(2\times 2)}{2} = \frac{200-4}{2} = \frac{196}{2}$$

$= 98$ gpm.

Even if the assumed evaporation and drift rates were perfectly accurate, the calculated blowdown rate of 98 gpm might still not be quite enough because of the effects of the aforementioned airborne contaminants, which are usually incalculable. Once the approximate level of blowdown has been determined, the circulating water quality should be regularly monitored and appropriate adjustments made.

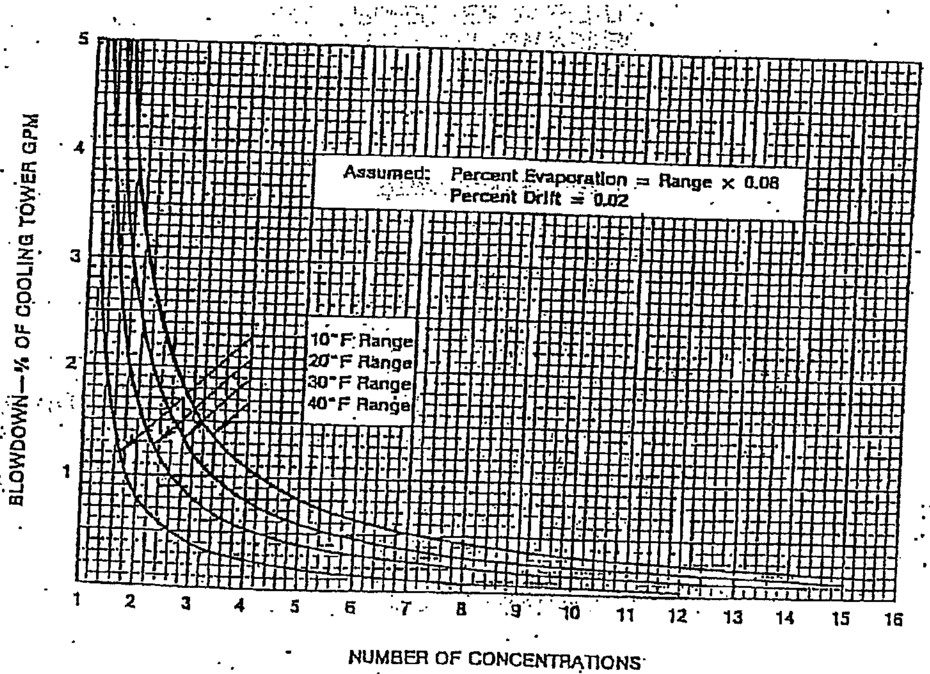


Figure 40 —Cooling tower blowdown versus number of concentrations.

From
"Cooling Tower Fundamentals"

1.1. COOLING TOWER SPECIFICATIONS AND EQUIPMENT DATA SHEET

IF ANY DIFFICULTIES OR PROBLEMS OCCUR, CALL:
PSYCHROMECTIC SYSTEMS, INC.
1-303-233-0400

TOWER MODEL NO.	CFF-302422-3I-18
CUSTOMER NAME	Micron Semiconductor, Inc.
CUSTOMER ORDER NUMBER	S-380278
PSYCROMETRIC SYSTEMS JOB NUMBER	93-105
LOCATION	Boise, ID
COMPLETION DATE	May, 1994

PERFORMANCE DATA

WATER CIRCULATION, US GPM	15,000
INLET WATER CIRCULATION TEMPERATURE, °F	90 °F
OUTLET WATER TEMPERATURE, °F	80 °F
DESIGN WET BULB TEMPERATURE	72 °F
ELEVATION	2700 ft

TOWER DESIGN DATA

TYPE	Inline Counterflow
NO. OF CELLS	3
CELL SIZE, FT X FT	30x24
OVERALL WIDTH/LENGTH, FT X FT	90x24
BASIN CURB TO DISTRIBUTION CENTER LINE	16'-0"
DISTRIBUTION TYPE	Low Pressure Down Spray
DRIFT LOSS, % CIRCULATION	.008
DRIFT ELIMINATOR TYPE	Munters D-15
FILL TYPE	Munters 19060 10 ml
ACCESS TO TOP OF TOWER	1 stair/1 ladder
FAN DECK LIVE LOAD/PSF	60
SNOW LOAD	10
DESIGN WIND VELOCITY, MPH	93

MOTOR DATA

TYPE	TEFC
FRAME SIZE	364T
MANUFACTURER	Toshiba
RATED CAPACITY, HP	60
OPERATING SPEED, RPM	1780
VOLTS/PHASE/CYCLE	480/3/60

-4-

Appendix G: Facility Emission Cap Calculations

FEC Calculation Information

	NOx	CO	SO2	PM10	VOC
Baseline Emissions Calculations					
Boilers (Bldg 4,25,32,80)	31.1	31.7	0.3	3.55	2.6
Emergency Generators (Site Wide)	3.8	0.8	0.5	0.09	0.1
Fugitive Emissions (Bldg 15, 22, 26)				4.3	
Manufacturing Emissions (Site Wide)				7.1	94.9
Cooling Towers[1]				14	
VOC Abatement Units[1]	4.4	4	0.03	0.3	0.2
Total Emissions	39	36	1	29	98
1) Cooling tower and VOC Abatement Unit emissions based on continuous operation.					
Proposed Growth Component					
New 30 MMBtu/hr boiler	3.9	4.1	0.03	0.4	0.3
Two cooling towers				1.7	
Five generators like 24D-GEN-02	16.3	6.0	3.7	0.5	0.1
Pollution control units	0.9	0.7		0.1	
New Fab (includes boilers and generators)	23.2	16.3	1.7	9.7	95
Total Growth Component	44	27	5	12	95
Operational Variability Component					
Total	39	37	1	14	39
Total FEC	**123**	**100**	**7**	**56**	**232**

Growth Component Calculations					
Boiler Operating Scenario	2,891	hrs blr op 11 months of year (36% capacity factor)			
	730	hrs of maximum operation one month per year			
	3,621	total annual hours of blr op for growth component			
Generator operating scenario	100	hours/year of capacity operation			
	NOx	CO	SO2	PM10	VOC
Each proposed boiler 30 MMBtu/hr	0.07 lb/MMBtu	0.08 lb/MMBtu	0.600 lb/MMscf	7.600 lb/MMscf	5.500 lb/MMscf
tpy:	3.9	4.1	0.03	0.4	0.3
Each generator like 24D-GEN-02, 100 hrs	8.090 g/bhp-hr	2.961 g/bhp-hr	1.835 g/bhp-hr	0.211 g/bhp-hr	0.405 g/bhp-hr
1826 hp tpy:	1.6	0.6	0.4	0.04	0.1
Each VOC unit like 1X-VOC, 1.5 MMBtu/hr	100 lb/MMscf	84 lb/MMscf	0.570 lb/MMscf	7.600 lb/MMscf	5.500 lb/MMscf
1000 Bty/scf tpy:	0.657	0.552	0.004	0.050	0.036

Please refer to the following two tables for additional generator and boiler information.

Emergency Generator Baseline Emissions

UNIT	RATED CAPACITY	Fuel Use	Emissions (tons per year)				
CODE	(HP)	(gal/hr)	NOx	CO	SO2	PM10	VOC
EU2-GEN-04	1851	84	0.32	0.01	0.01	0.002	0.003
EU2-GEN-07	1851	84	0.33	0.02	0.01	0.002	0.003
EU2-GEN-06	1801	88	0.20	0.04	0.02	0.007	0.003
EU2-GEN-08	1801	88	0.19	0.04	0.01	0.007	0.002
EU2-GEN-03	1443	70	0.24	0.05	0.04	0.007	0.007
EU2-GEN-02	339	17	0.07	0.02	0.00	0.005	0.007
EU2-GEN-09	449	23	0.06	0.02	0.00	0.005	0.001
EU2-GEN-10	1826	93	0.19	0.07	0.04	0.005	0.009
EU2-GEN-11	1826	93	0.21	0.08	0.05	0.005	0.010
EU2-GEN-12	1826	93	0.20	0.07	0.05	0.005	0.010
EU2-GEN-13	1826	93	0.19	0.07	0.04	0.005	0.010
EU2-GEN-14	1826	93	0.19	0.07	0.04	0.005	0.010
EU2-GEN-18	1851	84	0.29	0.01	0.01	0.002	0.003
EU2-GEN-15	1826	93	0.25	0.09	0.06	0.006	0.012
EU2-GEN-16	1826	93	0.24	0.09	0.05	0.006	0.012
EU2-GEN-17	1851	84	0.31	0.01	0.01	0.002	0.003
EU2-GEN-19	1826	93	0.20	0.07	0.04	0.005	0.010
EU2-FWP-02	481	30	0.09	0.02	0.01	0.006	0.009
TOTAL EMISSIONS			3.76	0.84	0.52	0.09	0.12
Emission Factors							
> 600 horse power units in (g/hp-hr)							
AP-42 Factors[1]			11	2.4	1.835	0.3178	0.33
EU2-GEN-04, 07, 17, 18, and 22[6]			12.6	0.58	0.57	0.07	0.13
EU2-GEN-06 AND 08[6]			8.367	1.559	0.635	0.296	0.106
EU2-GEN-10, 11, 12, 13, 14, 15, 16 AND 19[6]			8.09	2.961		0.211	0.405
< 600 horse power units in (g/hp-hr)							
AP-42 Factors[5]			14	3.03	0.931	1	1.35
Factors for EU2-GEN-09[6]			9.08	2.9	0.605	0.842	0.156
Heat value #2 diesel		0.13986	MMBtu/gal				

1. Emission factors from AP-42, Section 3.4, Large Stationary Diesel and All Stationary Duel Fuel Engines. AP-42 factors used where manufacturer's emission factor data not available.
2. Criteria Emission (LB/YR) = EF (G/HP-H) x RATED CAPACITY (HP) x HOURS OPERATED (H/YR) / 454 (G/LB)

   Criteria Emissions (TPY) = EF (G/HP-H) x RATED CAPACITY (HP) x HOURS OPERATED (H/YR) / 454 (G/LB) / 2000 (LB/TON)

   HAP Emissions (LB/YR)= EF X HEAT CAPACITY X FUEL USAGE X HOURS OF OPERATION
3. Modeled emissions are based on 200 hours of operation
4. These stack location names match the attached stack location drawing in Appendix I.
5. Emission factors AP-42, Section 3.3, Gasoline and Diesel Industrial Engines. AP-42 factors used where manufacturer's emission factor data not available.
6. Manufacturer's emission factors located in Appendix N

Boiler Baseline Emissions Calculations

	Gas Consumption (cubic feet/year)			Annual Emissions (tons)				
	2003	2004	Average	NOx	CO	SO2	PM10	VOC
Building 4								
Boiler 1	36,070,588	66,826,997	51,448,793	1.94	2.05	0.02	0.20	0.14
Boiler 2	22,457,985	55,869,353	39,163,669	1.48	1.56	0.01	0.15	0.11
Boiler 3	52,800,833	94,617,062	73,708,948	2.79	2.94	0.02	0.28	0.20
Boiler 4	68,470,865	81,449,355	74,960,110	2.83	2.99	0.02	0.28	0.21
Boiler 5	28,220,246	54,830,312	41,525,279	1.57	1.66	0.01	0.16	0.11
Boiler 6	99,233,673	92,151,031	95,692,352	3.62	3.82	0.03	0.36	0.26
Boiler 7	94,030,142	71,033,716	82,531,929	1.56	1.30	0.02	0.31	0.23
Building 25								
Boiler 1	101,037,657	67,531,667	84,284,662	3.19	3.36	0.03	0.32	0.23
Boiler 2	36,059,125	47,893,059	41,976,092	1.59	1.67	0.01	0.16	0.12
Boiler 3	31,478,344	42,790,680	37,134,512	1.40	1.48	0.01	0.14	0.10
Boiler 4	76,661,696	46,033,381	61,347,539	2.32	2.45	0.02	0.23	0.17
Boiler 5	93,085,967	82,773,561	87,929,764	3.32	3.51	0.03	0.33	0.24
Boiler 6	43,159,238	18,090,954	30,625,096	0.58	0.48	0.01	0.12	0.08
Boiler 7	29,484,045	101,999,514	65,741,780	1.24	1.04	0.02	0.25	0.18
Boiler 8	25,417,050	44,121,125	34,769,088	0.66	0.55	0.01	0.13	0.10
Boiler 9	5,198,405	29,534,206	17,366,306	0.33	0.27	0.01	0.07	0.05
Building 80								
Boiler 1[6]	1,337,896	1,719,581	1,528,739	0.08	0.06	0.00	0.01	0.00
Boiler 2[6]	1,337,896	1,719,581	1,528,739	0.08	0.06	0.00	0.01	0.00
Boiler 3[6]	1,337,896	1,719,581	1,528,739	0.08	0.06	0.00	0.01	0.00
Boiler 4[6]	1,337,896	1,719,581	1,528,739	0.08	0.06	0.00	0.01	0.00
Boiler 5[6]	1,337,896	1,719,581	1,528,739	0.08	0.06	0.00	0.01	0.00
Boiler 6[6]	1,337,896	1,719,581	1,528,739	0.08	0.06	0.00	0.01	0.00
Building 32								
Boiler 1	9,325,632	1,049,375	5,187,504	0.26	0.22	0.00	0.02	0.01
Total				31.14	31.74	0.28	3.55	2.57
Emission Factors[1]				7.20E-02	7.60E-02	6.00E-07	7.60E-06	5.50E-06
Emission Factors[2]				1.00E-04	8.40E-05			
Emission Factors[3]				3.60E-02	3.00E-02			
Heat Content[4]				1050	BTU/ft3			

1. Emission Factors for building 4 and building 25 boilers. PM10, SO2 and VOC emissions factors are from AP-42, Section 1.4, for small industrial boilers (<100 MMBtu/hr) in units lb/ft3. NOx and CO emission factors are from Sellers Engineering Co. in units of lb/MMBtu.
2. Emission Factors for Building 32 and Bld 80. All emission factors are from AP-42 Section 1.4 for Small Boilers (<100 MMBtu/hr) in units of lb/ft3
3. NOx emission factors for Bldg 4 boiler 7 and building 25 boilers 6,7,8, and 9 low NOx boilers from Sellers Engineering Co. in units of lb/MMBtu.
4. Heat content of natural gas from AP-42 Section 1.4 Natural Gas Combustion
5. Fuel usage is based on actual monitored values except for Building 32 where the gas usage is assumed to be maximum capacity flow rate through out the year.
6. There is only one meter measuring all gas used in building 80 boilers. Total usage was averaged over all 6 boilers.

Appendix H: Estimates of Emissions of Substances Listed at IDAPA 58.01.01.585 & 586

CAS#	Material	Current Consumption (lb/yr)	Potential Increase (lb/yr)	Emission Rate (lb/hr)	IDAPA EL (lb/hr)	Over EL ?	% of EL	Max Predicted Impact	IDAPA AAC/ AACC	Over AAC/ AACC?	% of AAC/ AACC
14808-60-7	Silica - Quartz	3377.5	2688.3	0.31	0.0067	YES	4580	4.01	5	No	80
60676-86-0	Silica Amorphous (Fused)	2143.6	1706.1	0.19	0.0067	YES	2907	2.54	5	No	51
7647-01-0	Hydrochloric Acid	7936.1	6316.5	0.72	0.05	YES	1442	9.42	375	No	3
7664-41-7	Ammonia	143771.4	114430.3	13.06	1.2	YES	1089	170.63	900	No	19
1310-58-3	Potassium Hydroxide	10072.8	8017.1	0.92	0.133	YES	688	11.95	100	No	12
101-68-8	Methylene Bisphenyl Isocyanate	188.0	149.6	1.7E-02	0.003	YES	569	0.22	2.5	No	9
7664-39-3	Hydrofluoric Acid (Fluorides)	10091.3	8031.9	0.92	0.167	YES	549	11.98	125	No	10
7782-50-5	Chlorine	6893.5	5486.7	0.63	0.2	YES	313	8.18	150	No	5
111-40-0	1,2-Ethanediamine, N-(2-Aminoethyl)-	8681.2	6909.5	0.79	0.267	YES	295	10.30	200	No	5
50-00-0	Formaldehyde	16.2	12.9	1.5E-03	0.00051	YES	288	0.01	0.077	No	7
7722-84-1	Hydrogen Peroxide	3115.8	2479.9	0.28	0.1	YES	283	3.70	75	No	5
7681-57-4	Sodium Metabisulfite	9800.0	7800.0	0.89	0.333	YES	267	11.63	250	No	5
1310-73-2	Sodium Hydroxide	3059.1	2434.8	0.28	0.133	YES	209	3.63	100	No	4
75-09-2	Methylene Chloride	35.7	28.4	3.2E-03	0.0016	YES	203	0.01	0.24	No	5
14464-46-1	Crystalline Silica, Cristobalite	69.6	55.4	6.3E-03	0.0033	YES	192	0.08	2.5	No	3
67-66-3	Chloroform	5.3	4.2	4.8E-04	0.00028	YES	172	0.00	0.043	No	4
7664-93-9	Sulfuric Acid	1062.0	845.2	9.6E-02	0.067	YES	144	1.26	50	No	3
10035-10-6	Hydrogen Bromide	947.2	753.9	8.6E-02	0.0667	YES	129	1.12	500	No	0
822-06-0	Hexamethylene Diisocyanate	20.3	16.2	1.8E-03	0.002	No	92		1.5		
71-43-2	Benzene	7.9	6.3	7.2E-04	0.0008	No	90		0.12		
144-62-7	Ethanedioic Acid	643.1	511.9	5.8E-02	0.067	No	87		50		
12001-26-2	Mica-Group Minerals	1408.3	1120.9	0.13	0.2	No	64		150		
1309-37-1	Ferric Oxide	2339.4	1862.0	0.21	0.333	No	64		250		
7783-54-2	Nitrogen Trifluoride	13212.0	10515.6	1.20	1.93	No	62		1450		
7697-37-2	Nitric Acid	2221.5	1768.2	0.20	0.333	No	61		250		
123-91-1	1,4-Dioxane	23.4	18.6	2.1E-03	0.0048	No	44		0.71		
111-42-2	Diethanolamine	4550.0	3621.4	0.41	1	No	41		750		
14523-22-9	Tetracarbonyldi-Mu-Chlorodirhodium	4.0	3.2	3.6E-04	0.001	No	36		0.5		
1305-62-0	Calcium Hydroxide	1154.4	918.8	0.10	0.333	No	31		250		
1314-56-3	Phosphorous Pentoxide	186.5	148.4	1.7E-02	0.067	No	25		50		
1314-13-2	Zinc Oxide	868.0	690.9	7.9E-02	0.333	No	24		50		
1477-55-0	M-Xylene Diamine	1.7	1.4	1.6E-04	0.0007	No	23		0.5		

CAS#	Material	Current Consumption (lb/yr)	Potential Increase (lb/yr)	Emission Rate (lb/hr)	IDAPA EL (lb/hr)	Over EL ?	% of EL	Max Predicted Impact	IDAPA AAC/ AACC	Over AAC/ AACC?	% of AAC/ AACC
67-63-0	Isopropanol	152924.4	121715.4	13.89	65.3	No	21		49000		
7784-42-1	Arsine	29.6	23.6	2.7E-03	0.013	No	21		10		
10024-97-2	Nitrous Oxide	10587.7	8427.0	0.96	6	No	16		4500		
106-99-0	1,3-Butadiene	3.6E-02	2.8E-02	3.2E-06	0.000024	No	14		0.0036		
67-64-1	Acetone	154220.9	122747.2	14.01	119	No	12		89000		
108-95-2	Phenol	1446.8	1151.5	0.13	1.27	No	10		950		
7723-14-0	Phosphorus	7.2	5.7	6.5E-04	0.007	No	9		5		
75-21-8	Ethylene Oxide	5.0E-02	3.9E-02	4.5E-06	0.000067	No	7		0.01		
141-43-5	2-Aminoethanol	364.2	289.9	3.3E-02	0.533	No	6		400		
7553-56-2	Iodine	4.4	3.5	4.0E-04	0.0067	No	6		5		
107-41-5	2,4-Pentanediol, 2-Methyl-	512.4	407.8	4.7E-02	0.806	No	6		6050		
123-42-2	Diacetone Alcohol	9956.4	7924.5	0.90	16	No	6		12000		
98-00-0	2-Furanmethanol	1520.4	1210.2	0.14	2.67	No	5		2000		
7637-07-2	Boron Trifluoride	81.1	64.5	7.4E-03	0.2	No	4		250		
64-19-7	Acetic Acid	562.4	447.7	5.1E-02	1.67	No	3		1250		
1338-23-4	Methyl Ethyl Ketone Peroxide	3.2	2.5	2.9E-04	0.01	No	3		7.5		
107-98-2	2-Propanol, 1-Methoxy-	7581.4	6034.2	0.69	24	No	3		18000		
108-65-6	1-Methoxy-2-Propanol Acetate	7395.1	5885.9	0.67	24	No	3		3600		
127-19-5	Dimethylacetamide	683.8	544.3	6.2E-02	2.33	No	3		1750		
75-07-0	Acetaldehyde	0.8	0.6	7.3E-05	0.003	No	2		0.45		
110-54-3	Hexane	2781.6	2213.9	0.25	12	No	2		9000		
123-86-4	Acetic Acid, Butyl Ester	9177.6	7304.6	0.83	47.3	No	2		35500		
111-76-2	2-Butoxy Ethanol	1285.9	1023.5	0.12	8	No	1		6000		
7664-38-2	Phosphoric Acid	10.6	8.4	9.6E-04	0.067	No	1		50		
107-21-1	Ethylene Glycol	127.7	101.6	1.2E-02	0.846	No	1		6350		
7726-95-6	Bromine	7.1	5.6	6.4E-04	0.047	No	1		35		
1303-96-4	Borax	7.4	5.9	6.7E-04	0.067	No	1		50		
12325-31-4	PLATINUM - SOLUBLE SALTS, As Pt	9.8E-03	7.8E-03	8.9E-07	0.0001	No	1		0.1		
123-31-9	Hydroquinone	13.0	10.3	1.2E-03	0.133	No	1		100		
85-44-9	Phthalic Anhydride	30.4	24.2	2.8E-03	0.4	No	1		300		
100-42-5	Styrene	387.2	308.2	3.5E-02	6.67	No	1		1000		
7782-49-2	Selenium And Compounds As Se	0.7	0.6	6.5E-05	0.013	No	1		10		
108-94-1	Cyclohexanone	336.7	268.0	3.1E-02	6.67	No	0		5000		

CAS#	Material	Current Consumption (lb/yr)	Potential Increase (lb/yr)	Emission Rate (lb/hr)	IDAPA EL (lb/hr)	Over EL ?	% of EL	Max Predicted Impact	IDAPA AAC/ AACC	Over AAC/ AACC?	% of AAC/ AACC
108-05-4	Vinyl Acetate	114.4	91.1	1.0E-02	2.3	No	0		1730		
64-17-5	Ethanol	5286.9	4208.0	0.48	125	No	0		94000		
109-99-9	Tetrahydrofuran	1442.4	1148.1	0.13	39.3	No	0		29500		
1305-78-8	Calcium Oxide	3.6	2.9	3.3E-04	0.133	No	0		100		
7782-41-4	Fluorine	3.5	2.8	3.2E-04	0.133	No	0		100		
1330-20-7	Xylene	695.5	553.5	6.3E-02	29	No	0		21750		
1344-95-2	Calcium Silicate	15.0	11.9	1.4E-03	0.667	No	0		500		
112926-00-8	Silica, Amorphous	13.4	10.7	1.2E-03	0.667	No	0		500		
67-56-1	Methanol	340.3	270.9	3.1E-02	17.3	No	0		13000		
78-93-3	Methyl Ethyl Ketone	739.8	588.8	6.7E-02	39.3	No	0		29500		
107-15-3	1,2-Ethanediamine	30.5	24.3	2.8E-03	1.67	No	0		1250		
108-46-3	Resorcinol	51.2	40.7	4.6E-03	3	No	0		2250		
120-80-9	Pyrocatechol	19.4	15.4	1.8E-03	1.33	No	0		1000		
1333-86-4	Carbon Black	2.5	2.0	2.3E-04	0.23	No	0		175		
124-40-3	Methanamine, N-Methyl-	6.5	5.1	5.9E-04	0.613	No	0		460		
25551-13-7	Trimethyl Benzene	84.5	67.2	7.7E-03	8.2	No	0		6150		
64-18-6	Formic Acid	6.4	5.1	5.8E-04	0.627	No	0		470		
7631-90-5	Sodium Bisulfite	3.3	2.6	3.0E-04	0.333	No	0		250		
107-02-8	Acrolein	0.2	0.1	1.5E-05	0.017	No	0		12.5		
131-11-3	Dimethyl Phthalate	2.9	2.3	2.6E-04	0.333	No	0		250		
628-63-7	Acetic Acid, Pentyl Ester	283.5	225.6	2.6E-02	35.3	No	0		26500		
8052-41-3	Stoddard Solvent	239.8	190.9	2.2E-02	35	No	0		26250		
7803-62-5	Silane	2.9	2.3	2.6E-04	0.467	No	0		350		
1303-86-2	Boric Anhydride	4.0	3.2	3.6E-04	0.667	No	0		500		
124-17-4	Diethylene Glycol	5.0	4.0	4.5E-04	0.846	No	0		625		
7440-65-5	YTTRIUM - (Metal And Compounds As Y)	0.4	0.3	3.4E-05	0.067	No	0		50		
108-10-1	Methyl Isobutyl Ketone	75.0	59.7	6.8E-03	13.7	No	0		10250		
71-36-3	1-Butanol	52.2	41.6	4.7E-03	10	No	0		7500		
108-88-3	Toluene	125.5	99.9	1.1E-02	25	No	0		18750		
1309-48-4	Magnesium Oxide	3.1	2.5	2.8E-04	0.667	No	0		500		
94-36-0	Benzoyl Peroxide	1.4	1.1	1.3E-04	0.333	No	0		250		
110-86-1	Pyridine	4.3	3.4	3.9E-04	1	No	0		750		
75-52-5	Nitromethane	13.1	10.4	1.2E-03	3.333	No	0		2500		
106-88-7	1,2-Butylene Oxide	3.0	2.4	2.7E-04	0.8	No	0		600		

CAS#	Material	Current Consumption (lb/yr)	Potential Increase (lb/yr)	Emission Rate (lb/hr)	IDAPA EL (lb/hr)	Over EL ?	% of EL	Max Predicted Impact	IDAPA AAC/ AACC	Over AAC/ AACC?	% of AAC/ AACC
91-20-3	Naphthalene	11.8	9.4	1.1E-03	3.33	No	0		2500		
7440-50-8	Copper	0.2	0.2	2.0E-05	0.067	No	0		50		
7803-51-2	Phosphine	8.9E-02	7.1E-02	8.1E-06	0.027	No	0		20		
75-04-7	Monoethanolamine	3.9	3.1	3.6E-04	1.2	No	0		900		
409-21-2	Silicon Carbide	2.0	1.6	1.8E-04	0.667	No	0		500		
13283-01-7	Tungsten (Vi) Chloride	0.2	0.1	1.5E-05	0.067	No	0		50		
74-99-7	Methyl Acetylene	274.6	218.5	2.5E-02	109	No	0		82000		
2426-08-6	N-Butyl Glycidyl Ether	18.4	14.6	1.7E-03	9	No	0		6750		
75-05-8	Acetonitrile	7.0	5.5	6.3E-04	4.47	No	0		3350		
2269-29-9	Aluminum Tri-Sec-Butoxide (Forms Aluminum Oxide)	1.0	0.8	9.0E-05	0.667	No	0		500		
100-41-4	Ethylbenzene	29.0	23.1	2.6E-03	29	No	0		21750		
8030-30-6	Naphtha	101.6	80.9	9.2E-03	106	No	0		79500		
68-12-2	Dimethylformamide	1.5	1.2	1.4E-04	2	No	0		1500		
110-43-0	2-Heptanone	11.9	9.5	1.1E-03	15.7	No	0		11750		
108-03-2	1-Nitropropane	4.1	3.2	3.7E-04	6	No	0		4500		
7440-36-0	Antimony	2.1E-02	1.7E-02	1.9E-06	0.033	No	0		25		
79-24-3	Nitroethane	13.1	10.4	1.2E-03	20.7	No	0		15500		
7440-58-6	Hafnium	2.0E-02	1.6E-02	1.8E-06	0.033	No	0		25		
109-66-0	Pentane	64.0	51.0	5.8E-03	118	No	0		88500		
60-29-7	Ethyl Ether	38.4	30.6	3.5E-03	80.67	No	0		60500		
1319-77-3	Cresol (Mixed Isomers)	0.6	0.5	5.5E-05	1.47	No	0		1100		
78-92-2	Sec-Butyl Alcohol	5.5	4.4	5.0E-04	20.3	No	0		15250		
62-53-3	Aniline	1.4E-04	1.1E-04	1.3E-08	0.0009	No	0		0.14		
79-01-6	Trichloroethylene	2.5	2.0	2.3E-04	17.93	No	0		13450		
141-78-6	Ethyl Acetate	8.8	7.0	8.0E-04	93.3	No	0		70000		
78-83-1	Isobutyl Alcohol	0.9	0.7	8.0E-05	10	No	0		6000		
110-82-7	Cyclohexane	6.1	4.9	5.6E-04	70	No	0		52500		
108-87-2	Methylcyclohexane	8.7	7.0	7.9E-04	107	No	0		80500		
75-44-5	Phosgene	2.2E-03	1.8E-03	2.0E-07	0.027	No	0		20		
84-74-2	Dibutyl Phthalate	2.6E-02	2.1E-02	2.4E-06	0.333	No	0		250		
108-91-8	Cyclohexylamine	0.2	0.2	1.7E-05	2.73	No	0		2050		
12039-88-2	Tungsten Silicide	2.0E-02	1.6E-02	1.8E-06	0.333	No	0		250		
78-10-4	Tetraethyl Silicate	0.3	0.3	3.0E-05	5.67	No	0		4250		
142-82-5	Heptane	5.3	4.2	4.8E-04	109	No	0		82000		

CAS#	Material	Current Consumption (lb/yr)	Potential Increase (lb/yr)	Emission Rate (lb/hr)	IDAPA EL (lb/hr)	Over EL ?	% of EL	Max Predicted Impact	IDAPA AAC/ AACC	Over AAC/ AACC?	% of AAC/ AACC
110-91-8	Morpholine	0.2	0.2	2.0E-05	4.67	No	0		350		
71-55-6	1,1,1 Trichloroethane	4.7	3.8	4.3E-04	127	No	0		95500		
110-19-0	Acetic Acid, 2-Methylpropyl Ester	1.6	1.3	1.5E-04	46.7	No	0		35000		
107-87-9	2-Pentanone	1.6	1.3	1.5E-04	46.7	No	0		35000		
75-65-0	Tert-Butyl Alcohol	0.7	0.5	6.1E-05	20	No	0		15000		
19287-45-7	Diborane	2.2E-04	1.8E-04	2.0E-08	0.007	No	0		5		
79-09-4	Proponic Acid	4.1E-02	3.3E-02	3.8E-06	2	No	0		1500		
109-59-1	2-Isopropoxyethanol	9.9E-02	7.9E-02	9.0E-06	7	No	0		5250		
79-10-7	Acrylic Acid	1.7E-02	1.3E-02	1.5E-06	2	No	0		1500		
109-60-4	Acetic Acid, Propyl Ester	0.5	0.4	4.2E-05	56	No	0		42000		
80-62-6	Methyl Methacrylate	0.1	9.9E-02	1.1E-05	27.3	No	0		20500		
71-23-8	N-Propanol	3.3E-02	2.6E-02	3.0E-06	33.3	No	0		25000		
7782-65-2	Germanium Tetrahydride	8.1E-06	6.4E-06	7.4E-10	0.04	No	0		30		

Appendix I: Modeling Protocol and Approval

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

RECEIVED
FEB 19 2003
BY:

1410 North Hilton • Boise, Idaho 83706-1255 • (208) 373-0502

Dirk Kempthorne, Governor
C. Stephen Allred, Director

February 14, 2003

CERTIFIED MAIL # 7099 3220 0009 1975 4861

Mr. Martin Bauer
Micron Technology, Inc.
8000 S. Federal Way
P.O. Box 6
Boise, ID 83707-0006

Re: Air Dispersion Modeling Protocol,
Micron Technology, Inc., Boise Facility

Dear Mr. Bauer:

On January 31, 2003, the Idaho Department of Environmental Quality (Department) received an air dispersion modeling protocol from Micron Technology, Inc. for the facility in Boise, Idaho. This protocol is for air dispersion modeling to be submitted in support of a Tier II operating permit application. This document was reviewed by our modeling staff to ensure compliance with the Department and EPA's requirements.

The modeling methodology and assumptions discussed in the protocol are appropriate for the air dispersion modeling analysis for this project, with the following exceptions:

- Ambient air should be analyzed in the application to ensure that it does not occur in the cavity regions of buildings. If ambient air is present in the cavity regions of buildings then this must be addressed with a model other than ISCST3. ISCST3 does not have the capability to analyze concentrations to receptors located in the cavity region of buildings.

- The maximum concentration for each averaging period must be compared to the significant contribution levels.

- The following design concentrations must be used when demonstrating compliance with the NAAQS:

  - NO_2
    Annual averaging period – highest ambient concentration
  - SO_2
    3-hour averaging period – highest, second highest ambient concentration
    24-hour averaging period – highest, second highest ambient concentration
    Annual averaging period – highest ambient concentration
  - CO
    -hour averaging period – highest, second highest ambient concentration
    8-hour averaging period – highest, second highest ambient concentration

- Pb
  Quarterly averaging period – highest ambient concentration
- PM_{10}
  24-hour averaging period (NAAQS only) – "the projected 24-hour average concentrations will not exceed the 24-hour NAAQS more than once per year on average" (EPA 2001). The design concentration is dependent on the number of meteorological data years used in the analysis. For example, if five years of NWS data were used, then the design concentration would be the sixth highest 24-hour ambient concentration that occurred at each receptor over that five-year period.
  Annual averaging period – highest ambient concentration

- Provide a description and justification for the parameters used in modeling each source. A reasonable description/justification of stack gas temperatures and exit flow velocities must be provided with the application. If any sources are modeled as non-point sources, then a description of the actual source and a justification for the source type chosen as well as the source parameters used in the modeling must be presented.

- The application must identify if point sources are vented horizontally, vertically, or have a raincap present.

- If Micron Technology, Inc. proposes new PM10 background concentrations, it is strongly encouraged to submit a protocol, which presents the methodology used in developing the background concentrations.

- DEQ requests that a discussion and justification for the use of rural dispersion coefficients be presented in the application.

The Department's modeling staff considers the submitted dispersion modeling protocol, with the additional items noted above, to be complete and approved. It should be noted, however, that the approval of this modeling protocol is not meant to imply approval of a completed dispersion modeling analysis. Please refer to the *State of Idaho Air Quality Modeling Guideline*, which is available on the Internet at http://www.deq.state.id.us/air/air_permits.htm, for further guidance.

To ensure a complete and timely review of the final analysis, our modeling staff requests that electronic copies of all modeling input files (including Building Profile Input Program (BPIP) and meteorological data files) and output files are submitted with an analysis report. In addition, a scaled facility plot plan, with building heights noted, should be submitted with the analysis report. If you have any further questions, please contact me at (208) 373-0202.

Sincerely,

Mary Anderson

Mary Anderson
Modeling Coordinator
Air Quality Division

MA:jml

CC: Bill Rogers, Air Quality Division
Kevin Schilling, Technical Services Division
Mike McGown, Boise Regional Office
SF
RF

Micron

Micron Technology, Inc.
8000 S. Federal Way
P.O. Box 6
Boise, ID 83707-0006
208.368.4000

January 30, 2003

Bill Rogers
Department of Environmental Quality
1410 North Hilton
Boise, ID 83706-1255

Dear Mr. Rogers:

In support of Micron Technology Inc.'s (MTI) Tier II permit application, enclosed is MTI's modeling protocol. MTI requests that IDEQ provide written or verbal approval of this protocol.

MTI remains committed to submitting a complete application for our Tier II permit in advance of the established deadline. MTI intends to schedule one more meeting with you to resolve the issues discussed during the January 22, 2003, meeting before the permit application is submitted.

If you have any questions or concerns regarding the enclosed protocol, please contact me at (208) 368-5960.

Sincerely,

Martin Bauer

Martin Bauer
Environmental Engineer

RECEIVED
JAN 31 2003
By Jan Hollar

MB/dm

Enclosure

cc/enc: Pat Nair - DEQ
Mary Anderson – DEQ

The future of memory

TIER II PERMIT APPLICATION MODELING METHODOLOGY FOR THE MICRON TECHNOLOGY, INC., BOISE FACILITY

Dispersion Model Selection

In support of a Tier II permit application, regulatory modeling techniques have been surveyed to select the most appropriate air quality dispersion model to simulate the various sources of air pollutants at the Micron Technology, Inc. (MTI) Boise facility. Building downwash and plumes that impact complex terrain are issues that influence the selection of regulatory modeling tools. The terrain surrounding the facility is relatively flat, however, extensive complex terrain exists to the northeast of the facility. ISCST3 is the current regulatory dispersion model for complex source configurations and for sources subject to building downwash (40 CFR Part 51, Appendix W). Based on this, ISCST3 will be used to predict concentrations attributable to emissions from the facility.

Meteorological Data

A five-year meteorological database will be constructed using surface and upper air data from Boise Airport, consistent with DEQ's Air Quality Modeling Guideline and 40 CFR Part 51, Appendix W. These data will be obtained from the EPA SCRAM Internet site for the period 1987 to 1991, the most recent and worst case five-year period available on the SCRAM site. The data will be processed for ISCST3 using the EPA meteorological pre-processor program PCRAMMET. In order to avoid hours of unrealistically low mixing heights caused by the interpolation algorithms in PCRAMMET, the final input files will be screened to ensure all mixing heights are greater than 50 meters (m); justification for this step is discussed in more detail below.

The ISCST3 dispersion model program simulates plume trapping during daytime hours using estimates of the hourly mixing height. Plumes below the mixing height are constrained with multiple reflections between the mixing height and the surface until the plume is well mixed. Plumes above the daytime mixing height are assumed to never reach the surface and are dropped from the simulations. It should be noted that mixing heights are not used during the stable hours by ISCST3.

The EPA meteorological pre-processor programs PCRAMMET and MPRM calculate hourly mixing heights during daytime hours based on interpolation from the twice-daily data input by the user. Using rural conditions (discussed further in "Modeling Options"), the interpolation assumes linear growth due to convection from the surface to the afternoon maximum mixing height when the last hour of nighttime is stable. When daytime begins just before the hour by a few minutes, the linear interpolation can result in an unrealistically low mixing height for that hour. These routines also neglect the growth of the mixed layer caused by mechanical turbulence that can be more important than convection for hours with even moderate wind speeds.

Modelers have recognized this shortcoming in PCRAMMET and MPRM for many years and it is customary to either assign a minimum mixing height, replace the hour with a missing data flag, or assign the mixing height using a different algorithm. The more recent pre-processor program AERMET always checks the daytime mixing height against a mechanically driven value and CALMET, the meteorological pre-processor program for the CALPUFF modeling system, uses a default minimum mixing height of 50-m.

The minimum mixing height for ISCST3 simulations will be 50-m based on the default minimum used by CALPUFF. This minimum mixing height is also near the minimum mechanical mixing height possible in AERMET under neutral conditions. The mechanical mixing height (m) in AERMET is based on 2300 × ustar1.5, where ustar is the friction velocity (m/s). For example, assuming a minimum wind speed of 1 m/s at 10-m, neutral conditions, and a surface roughness length of 0.10-m, ustar is 0.087 m/s and the AERMET formula results in minimum mixing height of 59-m. For a smoother surface with a roughness length of 0.03-m, the minimum mixing height under these same conditions would be 42 m. A 50-m minimum mixing height will be used to avoid unrealistic plume trapping of low-level sources and the non-conservative assumption of neglecting emissions from relatively low point sources caused by the PCRAMMET algorithms. This procedure has been applied to meteorological data sets used in modeling submitted to, and approved by, DEQ in the past.

Figure 1 displays a wind rose for the five-year meteorological database. Winds at Boise Airport are bimodal, following the general southeast to northwest orientation of the valley, bounded by the Boise and Owyhee Mountains. The average wind velocity for the five-year period is 3.5 meters per second (m/s) and periods of calm wind occur for 7.9 percent of the observations. The wind patterns at Boise Airport should be characteristic of conditions at the facility, as it is located only 5 miles from the airport.

Modeling Options

ISCST3 will be applied using the previously discussed meteorological data. Emission data will be developed consistent with the discussion between MTI and DEQ on December 20, 2002. Regulatory default options appropriate for rural conditions will be used in the simulations, based on the population density and land use of the area surrounding the facility, as outlined in DEQ's Air Quality Modeling Guideline and 40 CFR Part 51 Appendix W.

Receptor Locations

Several receptor grids will be used in simulations of the facility. The proposed modeling region shown in Figures 2 and 3 is 5-km by 5-km, with receptors on a 200-m mesh grid and additional receptors on the facility site boundary. Terrain elevations for the receptors will be prepared using United States Geological Survey 7.5-minute quadrangles. These data have a horizontal spatial resolution of about 30-m. Terrain heights surrounding the facility indicate receptors are not located in "complex terrain" (above stack height).

Preliminary modeling results will be reviewed, and a 50-m mesh grid will be added to ensure the maximum concentration predictions occur within a fine receptor grid area. If the maximum concentration of a pollutant occurs at a receptor outside the 50-m mesh grid, an additional 50-m grid will be located around that receptor and the model will be reapplied.

Background Concentrations

In order to account for criteria pollutant emissions from other anthropogenic and natural sources, background concentrations will be added to the pollutant concentrations predicted for the facility. Background concentrations provided by Mary Anderson of DEQ in an e-mail sent on January 13, 2003, are presented in Table 1.

Air Quality Criteria

Modeling results will be compared to the EPA's significant impact levels (SILs) for criteria pollutants. The design concentration for each pollutant with a 24-hour NAAQS will be based on the sixth highest prediction at the same receptor in a five-year simulation. Annual concentrations will be based on the maximum annual concentration prediction. Design concentrations for pollutants exceeding the SILs will be combined with background concentrations and compared to the corresponding NAAQS.

Table 1
IDEQ Background Concentrations for Boise, Idaho Area

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)
PM10	24-hour	80 (a)
	Annual	18 (a)
SO_2	3-hour	42
	24-hour	26
	Annual	8
CO	1-hour	13,740 (b)
	8-hour	4,680 (c)
NO_2	Annual	40

(a) PM10 background concentrations based on data from the Les Bois School monitoring station. These concentrations may change if more appropriate ambient data is identified.
(b) Actual background concentration provided by IDEQ is 12 ppm CO
(c) Actual background concentration provided by IDEQ is 4 ppm CO

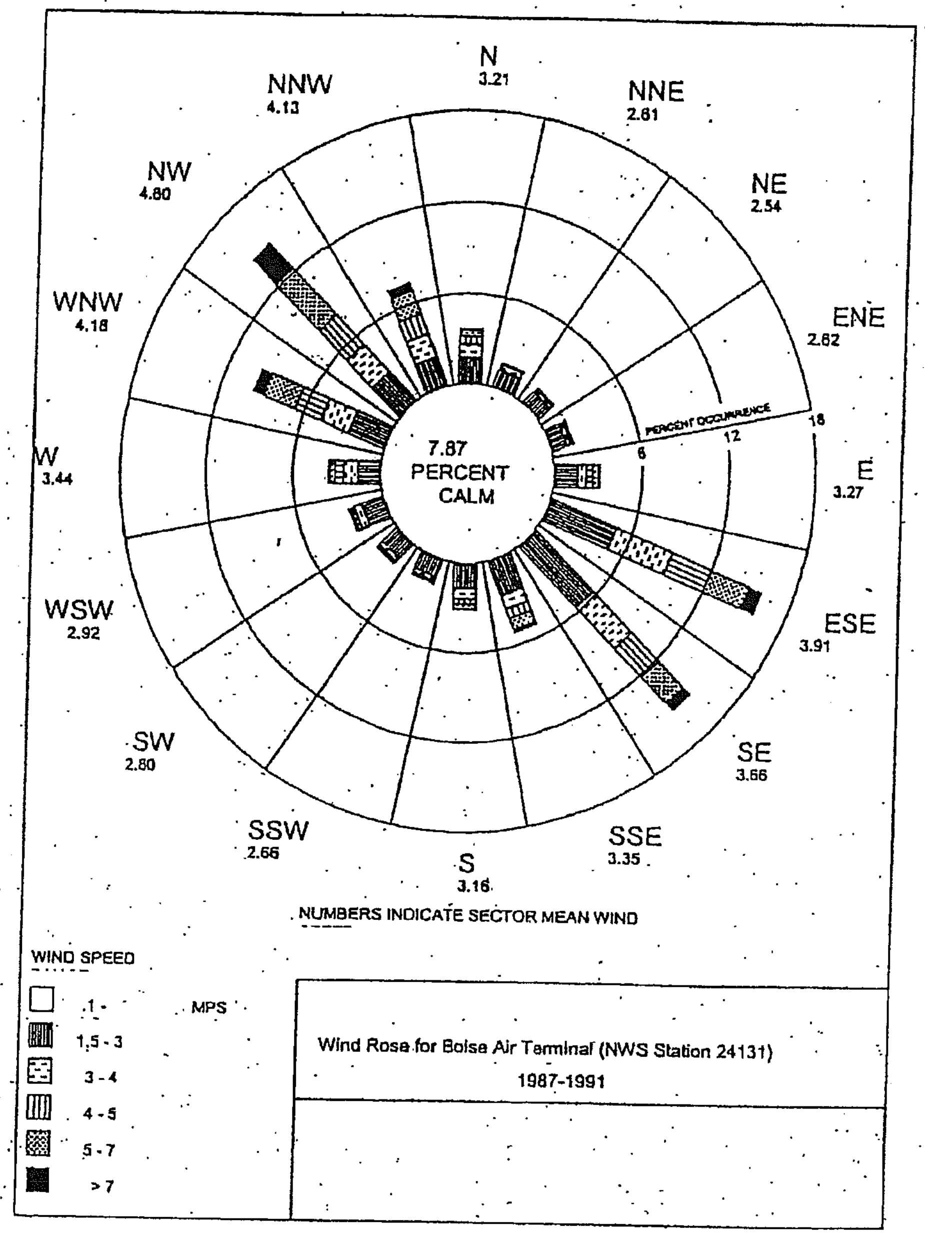


Figure 1. Wind Rose of Surface Meteorological Data – Boise Air Terminal 1987-1991

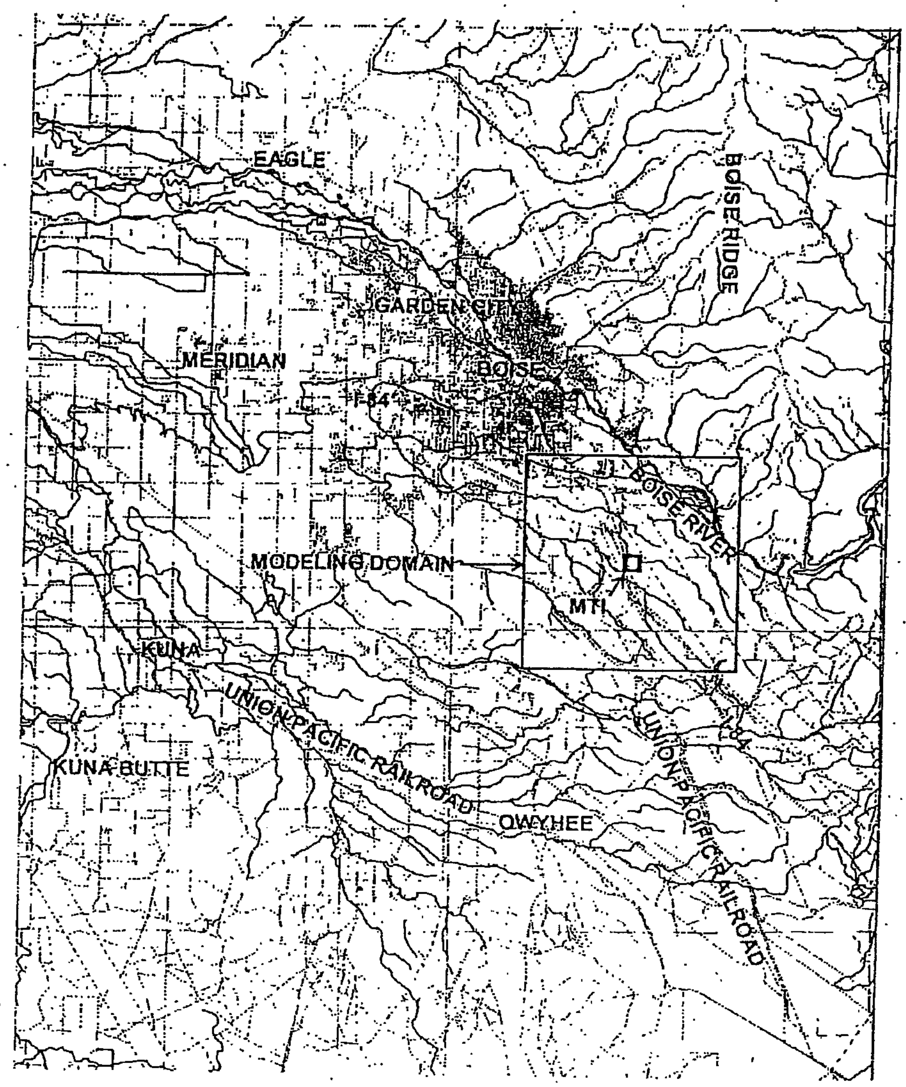


Figure 2. Vicinity of MTI Study Area

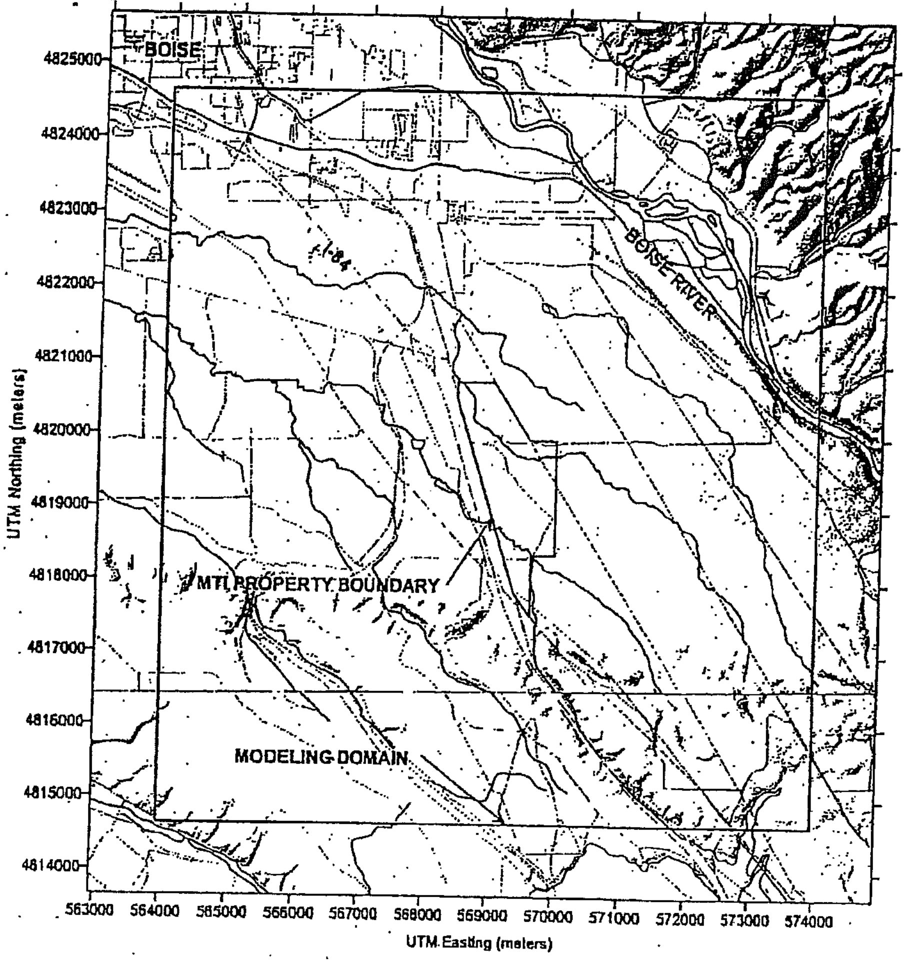


Figure 3. MTI Study Area

Appendix J: Site Plan

Appendix K: Compact Disc with Model Input Files

Appendix L: Modeled Point Sources and Parameters

TABLE L-1. POINT EMISSION SOURCES

Source	Associated Building	Stack/ Vent	Model ID
EU1 -- Natural Gas-Fired Boilers			
BOILER EU1-0401	4	1	4-BOI-01
BOILER EU1-0402	4	2	4-BOI-02
BOILER EU1-0403	4	3	4-BOI-03
BOILER EU1-0404	4	4	4-BOI-04
BOILER EU1-0405	4	5	4-BOI-05
BOILER EU1-0406	4	6	4-BOI-06
BOILER EU1-0407	4	7	4-BOI-07
BOILER EU1-2501	25	1	25-BOI-01
BOILER EU1-2502	25	2	25-BOI-02
BOILER EU1-2503	25	3	25-BOI-03
BOILER EU1-2504	25	4	25-BOI-04
BOILER EU1-2505	25	5	25-BOI-05
BOILER EU1-2506	25	6	25-BOI-06
BOILER EU1-2507	25	7	25-BOI-07
BOILER EU1-2508	25	8	25-BOI-08
BOILER EU1-2509	25	9	25-BOI-09
BOILER EU1-3201	32	1	32-BOI-01
BOILERS, 8001-8006	80	1	80-BOI-01
EU4 -- Manufacturing Processes			
ACID SCRUBBER	1	1	1-FS-01
ACID SCRUBBER	1	2	1-FS-02
ACID SCRUBBER	1	3	1-FS-03
ACID SCRUBBER	1X	1	1-FS-101
ACID SCRUBBER	1X	2	1-FS-102
ACID SCRUBBER	1X	3	1-FS-103
ACID SCRUBBER	1X	4	1-FS-104
AMMONIA SCRUBBER	1X	105	1-AMS-105
ENERGENCY SCRUBBER	3	1	3-GBFS-01
ACID SCRUBBER	4	1	4-FS-01
ACID SCRUBBER	4	2	4-FS-02
ACID SCRUBBER	5	1	5-FS-01
ACID SCRUBBER	5	2	5-FS-02
ACID SCRUBBER	5	3	5-FS-03
ACID SCRUBBER	15	1	15-FS-01
ACID SCRUBBER	15	2	15-FS-02
ACID SCRUBBER	15	3	15-FS-03
ACID SCRUBBER	15	4	15-FS-04
ACID SCRUBBER	16	1	16-FS-01
ACID SCRUBBER	16	2	16-FS-02
AMMONIA SCRUBBER	24	1	24-AMS-01
AMMONIA SCRUBBER	24	2	24-AMS-02
ACID SCRUBBER	24	3	24-FS-03
ACID SCRUBBER	24	4	24-FS-04
ACID SCRUBBER	24	5	24-FS-05
ACID SCRUBBER	24	6	24-FS-06
ACID SCRUBBER	24	7	24-FS-07

Source	Associated Building	Stack/ Vent	Model ID
AMMONIA SCRUBBER	24	8	24-AMS-08
ACID SCRUBBER	24	9	24-FS-09
ACID SCRUBBER	24	10	24-FS-10
ACID SCRUBBER	24	11	24-FS-11
AMMONIA SCRUBBER	24	12	24-AMS-12
AMMONIA SCRUBBER	24	13	24-AMS-13
ACID SCRUBBER	26	1	26-FS-01
ACID SCRUBBER	26	2	26-FS-02
AMMONIA SCRUBBER	24D	1	24D-AMS-01
MULTIPURPOSE SCRUBBER	24D	1	24D-MPS-01
ACID SCRUBBER	24D	1	24D-FS-01
ACID SCRUBBER	24D	2	24D-FS-02
ACID SCRUBBER	24D	3	24D-FS-03
ACID SCRUBBER	24D	4	24D-FS-04
ACID SCRUBBER	80	1	80-FS-01
ACID SCRUBBER	80	2	80-FS-02
EMERGENCY DRY SCRUBBER	10	1	10-FS-01
EMERGENCY DRY SCRUBBER	10	2	10-FS-02
Emergency Generators			
GENERATOR 06	1	1	1-GEN-01
GENERATOR 08	2	1	2-GEN-01
GENERATOR 10	4	1	4-GEN-01
GENERATOR 02	10	1	10-GEN-01
GENERATOR 03	15	1	15-GEN-01
GENERATOR 12	17	1	17-GEN-01
GENERATOR 07	26	1	26-GEN-01
GENERATOR 04	24	1	24-GEN-01
GENERATOR 11	25	1	25-GEN-01
GENERATOR 13	6	1	6-GEN-01
GENERATOR 09	38	1	38-GEN-01
GENERATOR 14	17	1	17C-GEN-01
GENERATOR 16	24D	1	24D-GEN-01
GENERATOR 15	24D	2	24D-GEN-02
GENERATOR 21	24D	3	24D-GEN-03
GENERATOR 18	36	1	36-GEN-01
GENERATOR 17	36	1	36-GEN-01
GENERATOR 19	80	1	80-GEN-01
GENERATOR 20	80	2	80-GEN-02
GENERATOR 22	36	2	36-GEN-02
FIRE WATER PUMP	FWP	2	FWP-2
VOC Abatement Devices			
VOC Abatement Device	1X	1	1X-VOC
VOC Abatement Device	2	1	2-VOC
VOC Abatement Device	15	1	15-VOC
VOC Abatement Device	24	1	24-VOC
VOC Abatement Device	24C	1	24C-VOC
VOC Abatement Device	24D	1	24D-VOC
VOC Abatement Device	24E	1	24E-VOC
VOC Abatement Device	80	1	80-VOC

Source	Associated Building	Stack/ Vent	Model ID
Miscellaneous Sources			
COOLING TOWER	4	1	4-COOL-01
COOLING TOWER	4	2	4-COOL-02
COOLING TOWER	4	3	4-COOL-03
COOLING TOWER	4	4	4-COOL-04
COOLING TOWER	4	5	4-COOL-05
COOLING TOWER	4	6	4-COOL-06
COOLING TOWER	4	7	4-COOL-07
COOLING TOWER	4	8	4-COOL-08
COOLING TOWER	4	9	4-COOL-09
COOLING TOWER	6	1	6-COOL-01
COOLING TOWER	6	2	6-COOL-02
COOLING TOWER	6	3	6-COOL-03
COOLING TOWER	25	1	25-COOL-01
COOLING TOWER	25	2	25-COOL-02
COOLING TOWER	25	3	25-COOL-03
COOLING TOWER	25	4	25-COOL-04
COOLING TOWER	25	5	25-COOL-05
COOLING TOWER	25	6	25-COOL-06
COOLING TOWER	25	7	25-COOL-07
COOLING TOWER	25	8	25-COOL-08
COOLING TOWER	38	1	38-COOL-01
COOLING TOWER	38	2	38-COOL-02
SILO	SILO1	1	SILO1
SILO	SILO2	1	SILO2

The Model IDs indicate the associated building (1, 24D, etc.), the type of equipment ("BOI" for boiler, "GEN" for generator, "FS", "AMS" or "MPS" for wet scrubber, "VOC" for VOC abatement device, "COOL" for cooling tower), and the unit number (1, 2, 3, etc.). The exceptions are the fire water pump generator and the silos, and in some cases a directional is used (E, W, S, N) with the equipment type.

TABLE L-2. MODELED POINT SOURCE EMISSION RATES

Model ID	Emission Rate (lb/hr)[a]			
	NOx	CO	SO2	PM10
4-BOI-01	0.904	0.955	.00718	0.0909
4-BOI-02	0.904	0.955	.00718	0.0909
4-BOI-03	1.81	1.91	0.0143	0.182
4-BOI-04	1.81	1.91	0.0143	0.182
4-BOI-05	2.11	2.23	0.0167	0.212
4-BOI-06	2.11	2.23	0.0167	0.212
4-BOI-07	0.90	0.75	0.0143	0.212
25-BOI-01	1.81	1.91	0.0143	0.0182
25-BOI-02	0.904	0.955	.00718	0.0909
25-BOI-03	0.904	0.955	.00178	0.0909
25-BOI-04	1.81	1.91	0.0143	0.182
25-BOI-05	1.81	1.91	0.0143	0.182
25-BOI-06	0.90	0.75	0.0143	0.182
25-BOI-07	0.90	0.75	0.0143	0.182
25-BOI-08	0.90	0.75	0.0143	0.182
25-BOI-09	0.90	0.75	0.0143	0.182
32-BOI-01	0.11	0.09	.000643	0.0084
80-BOI-01	1.14	0.96	.00686	0.104
1-FS-01				0.00468
1-FS-02				0.00468
1-FS-03				(b)
1-FS-101				0.238
1-FS-102				0.238
1-FS-103				0.238
1-FS-104				(b)
1-AMS-105				0.0340
3-GBFS-01				(c)
4-FS-01				(b)
4-FS-02				0.000695
5-FS-01				0.000775
5-FS-02				0.000775
5-FS-03				(b)
15-FS-01				0.181
15-FS-02				0.181
15-FS-03[d]				0.183
15-FS-04				(b)
15-AMS-05				0.0596
15-AMS-05				(b)
16-FS-01				0.00011
16-FS-02				(b)
24-AMS-01				0.0354
24-AMS-02				0.0354
24-FS-03				0.0354
24-FS-04				0.0257
24-FS-05				0.0257
24-FS-06				0.0181

Model ID	Emission Rate (lb/hr)[a]			
	NOx	CO	SO2	PM10
24-FS-07				0.0181
24-AMS-08				0.0296
24-FS-09				0.0272
24-FS-10				(b)
24-FS-11				(b)
24-AMS-12				(b)
24-AMS-13				0.00969
26-FS-01[e]				0.0410
26-FS-02				(b)
24D-AMS-01				0.0216
24D-MPS-01				0.00863
24D-FS-01				0.0388
24D-FS-02				0.0388
24D-FS-03				0.0388
24D-FS-04				(b)
80-FS-01				0.0050
80-FS-02				(b)
10-FS-01				(c)
10-FS-02				(c)
1-GEN-01	33.22	6.19	2.52	1.18
1X-GEN-01	33.22	6.19	2.52	1.18
4-GEN-01	27.12	11.92	7.39	0.60
10-GEN-01	10.46	2.26	0.70	0.75
15-GEN-01	34.99	7.63	5.84	0.77
17-GEN-01	27.12	11.92	7.39	0.60
17C-GEN-01	32.55	11.92	7.39	0.85
26-GEN-01	51.42	2.37	2.33	0.29
24-GEN-01	51.42	2.37	2.33	0.29
25-GEN-01	32.55	11.92	7.39	0.85
6-GEN-01	32.55	11.92	7.39	0.85
38-GEN-01	8.98	2.9	0.6	0.83
24D-GEN-02	32.55	11.92	7.39	0.85
24D-GEN-03	32.55	11.92	7.39	0.85
36-GEN-01	51.42	2.37	2.33	0.29
36-GEN-01	51.42	2.37	2.33	0.29
80-GEN-01	32.55	11.92	7.39	0.85
FWP-02	14.83	3.21	0.99	1.06
1X-VOC	0.15	0.126	0.000855	0.0114
2-VOC	0.2	0.168	0.00114	0.0152
15-VOC	0.2	0.168	0.00114	0.0152
24-VOC	0.15	0.126	0.000855	0.0114
24C-VOC	0.075	0.063	0.000428	0.0057
24D-VOC	0.2	0.168	0.001140	0.0152
24E-VOC	0.15	0.126	0.000855	0.0114
80-VOC	0.09	0.0756	0.000513	0.00684
4-COOL-01				0.0563
4-COOL-02				0.0563
4-COOL-03				0.0563
4-COOL-04				0.0563

Model ID	Emission Rate (lb/hr)[a]			
	NOx	CO	SO2	PM10
4-COOL-05				0.0563
4-COOL-06				0.1952
4-COOL-07				0.1952
4-COOL-08				0.1952
4-COOL-09				0.1952
6-COOL-01				0.1952
6-COOL-02				0.1952
6-COOL-03				0.1952
25-COOL-01				0.2626
25-COOL-02				0.2626
25-COOL-03				0.2626
25-COOL-04				0.2626
25-COOL-05				0.2626
25-COOL-06				0.2626
25-COOL-07				0.2626
25-COOL-08				0.2626
38-COOL-01				0.1952
38-COOL-02				0.1952
SILO1				0.006
SILO2				0.006

(a) Emissions from the boilers, the cooling towers, and diesel generators are the hypothetical maximum emissions.
(b) Wet scrubbers operate in groups, with one scrubber kept in standby mode. Emissions are apportioned to the operational scrubbers.
(c) Emergency Use Only
(d) Includes the former fugitive emission of 16 lb/yr.
(e) Includes the former fugitive emission of 378 lb/yr.

TABLE L-3. POINT SOURCE PARAMETERS

Model ID	Stack Height (ft)	Stack Diameter (ft)	Exhaust Temperature (F)	Exhaust Exit Velocity (ft/s)
4-BOI-01	35	1.8	478	30.0
4-BOI-02	35	1.8	478	30.0
4-BOI-03	35	2.5	478	30.0
4-BOI-04	35	2.5	478	30.0
4-BOI-05	35	2.5	478	30.0
4-BOI-06	35	2.5	478	30.0
4-BOI-07	35	2.5	478	30.0
25-BOI-01	44	2	478	30.0
25-BOI-02	44	2	478	30.0
25-BOI-03	44	3	478	30.0
25-BOI-04	44	3	478	30.0
25-BOI-05	44	2	478	30.0
25-BOI-06	44	3	478	30.0
25-BOI-07	44	3	478	30.0
25-BOI-08	44	3	478	30.0
25-BOI-09	44	3	478	30.0
32-BOI-01	22	1.17	478	12.0
80-BOI-01	48	1.33	350	12.7
1-FS-01	67	2.8	60	54.1
1-FS-02	67	2.8	60	54.1
1-FS-03	67	2.8	60	54.1
1-FS-101	74	3.17	60	73.9
1-FS-102	74	3.17	60	73.9
1-FS-103	74	3.17	60	73.9
1-FS-104	69	3.17	60	73.9
1-AMS-105	69	3.17	60	31.7
3-GBFS-01	69	1.18	60	82.5
4-FS-01	48	3	60	27.6
4-FS-02	48	3	60	27.6
5-FS-01	40	2	60	50.4
5-FS-02	40	2	60	50.4
5-FS-03	40	2	60	50.4
15-FS-01	57	3.83	60	50.9
15-FS-02	57	3.83	60	50.9
15-FS-03	57	3.83	60	50.9
15-FS-04	57	4.17	60	50.9
15-AMS-05	57	3.0	60	27.4
15-AMS-06	57	3.0	60	27.4
16-FS-01	39	1	60	50.9
16-FS-02	39	1	60	50.9
24-AMS-01	48	2.5	60	47.5
24-AMS-02	48	2.5	60	47.5
24-FS-03	48	2.5	60	47.5
24-FS-04	48	2.5	60	23.8
24-FS-05	48	2.5	60	23.8
24-FS-06	58	4.5	60	21.0

Model ID	Stack Height (ft)	Stack Diameter (ft)	Exhaust Temperature (F)	Exhaust Exit Velocity (ft/s)
24-FS-07	58	4.5	60	21.0
24-AMS-08	48	2.5	60	39.7
24-FS-09	58	4	60	39.8
24-FS-10	63	4	60	39.8
24-FS-11	48	2.5	60	12.6
24-AMS-12	48	2.67	60	31.9
24-AMS-13	48	2.67	60	31.9
26-FS-01	50	4.0	60	23.9
26-FS-02	50	4.0	60	23.9
24D-AMS-01	65	3.8	60	47.8
24D- MPS -01	65	3.8	60	26.5
24D-FS-01	65	3.8	60	65.1
24D-FS-02	65	3.8	60	65.1
24D-FS-03	65	3.8	60	65.1
24D-FS-04	65	3.8	60	65.1
80-FS-01	48	3.5	60	31.2
80-FS-02	48	3.5	60	31.2
1-GEN-01	13	0.75	878	312
1X-GEN-01	13	0.75	878	312
4-GEN-01	18	0.67	819	517
10-GEN-01	9	0.67	992	163
15-GEN-01	13	0.67	878	163
16-GEN-01	18	0.67	819	517
17-GEN-01	9	0.67	819	517
17C-GEN-01	18	0.67	819	517
26-GEN-01	15	0.75	905	363
24-GEN-01	15	0.75	905	363
25-GEN-01	18	0.67	819	517
6-GEN-01	12	0.67	819	517
38-GEN-01	9	0.5	908	203
24D-GEN-02	18	0.67	819	517
24D-GEN-03	18	0.67	819	517
36-GEN-01	15	0.75	905	363
36-GEN-02	15	0.75	905	363
80-GEN-01	48	0.67	819	517
FWP-2	18	0.5	1000	255
1X-VOC	68	1.18	735	102.1
2-VOC	47	1.18	735	228.6
15-VOC	46	1.18	735	457.2
24-VOC	60	1.18	735	102.1
24C-VOC	55	1.18	735	102.1
24D-VOC	55	1.18	735	228.6
24E-VOC	69	1.18	735	129.5
80-VOC	86	1.18	735	76.2
4-COOL-01	20	13	AMB.	26.0
4-COOL-02	20	13	AMB.	26.0
4-COOL-03	20	13	AMB.	26.0
4-COOL-04	20	13	AMB.	26.0

Model ID	Stack Height (ft)	Stack Diameter (ft)	Exhaust Temperature (F)	Exhaust Exit Velocity (ft/s)
4-COOL-05	20	13	AMB.	26.0
4-COOL-06	25	24	AMB.	14.0
4-COOL-07	25	24	AMB.	14.0
4-COOL-08	25	20	AMB.	17.0
4-COOL-09	25	20	AMB.	17.0
6-COOL-01	14	8	AMB.	42
6-COOL-02	14	8	AMB.	42
6-COOL-02	14	8	AMB.	42
25-COOL-01	35	24	AMB.	14.0
25-COOL-02	35	24	AMB.	14.0
25-COOL-03	35	24	AMB.	14.0
25-COOL-04	35	24	AMB.	14.0
25-COOL-05	35	24	AMB.	14.0
25-COOL-06	35	24	AMB.	14.0
25-COOL-07	35	24	AMB.	14.0
25-COOL-08	35	24	AMB.	14.0
38-COOL-01	24	10	AMB.	33
38-COOL-02	24	10	AMB.	33
SILO1	65	1.6	AMB.	5.8
SILO2	65	1.6	AMB.	5.8

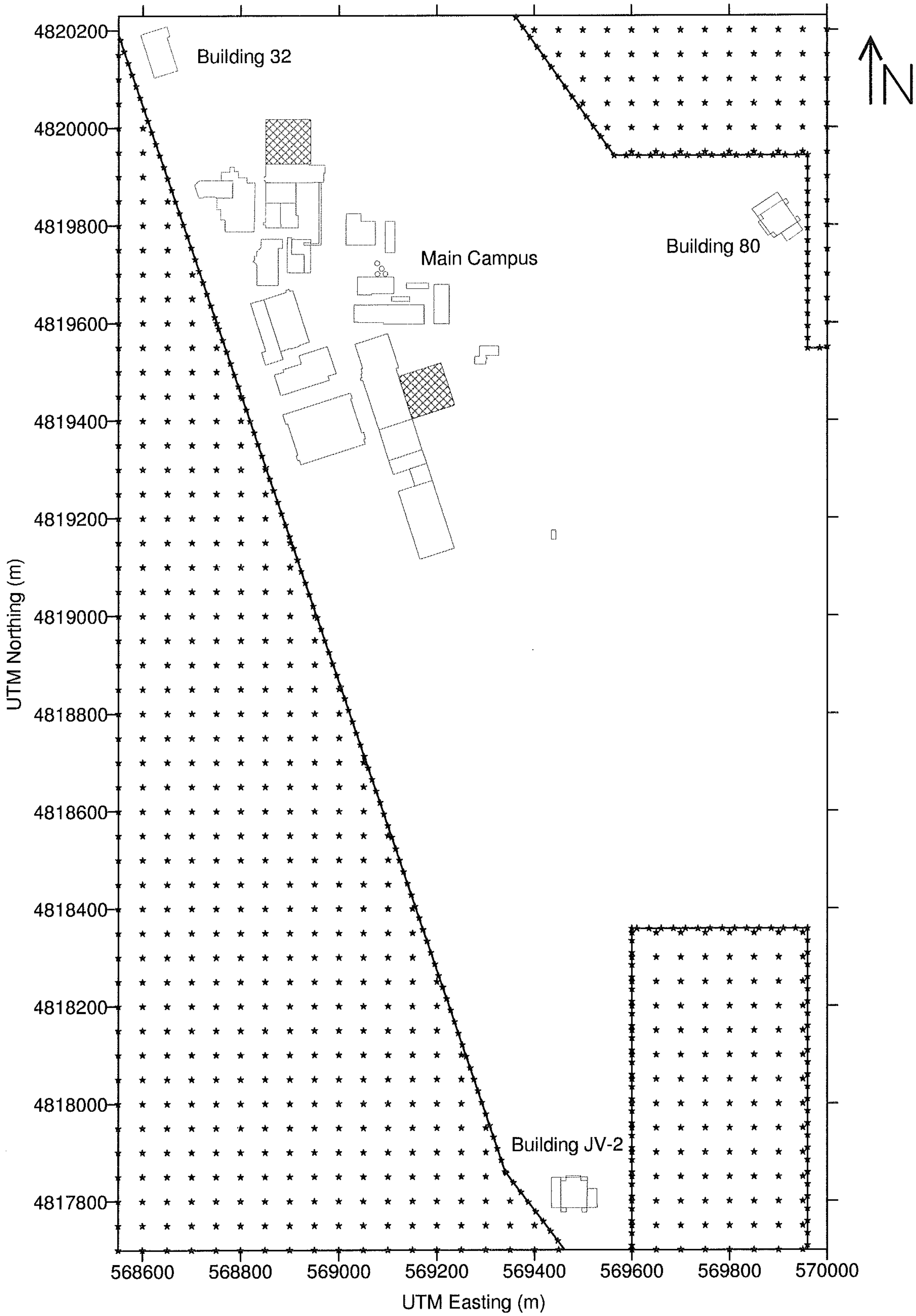


FIGURE L-1. MTI CAMPUS OVERVIEW

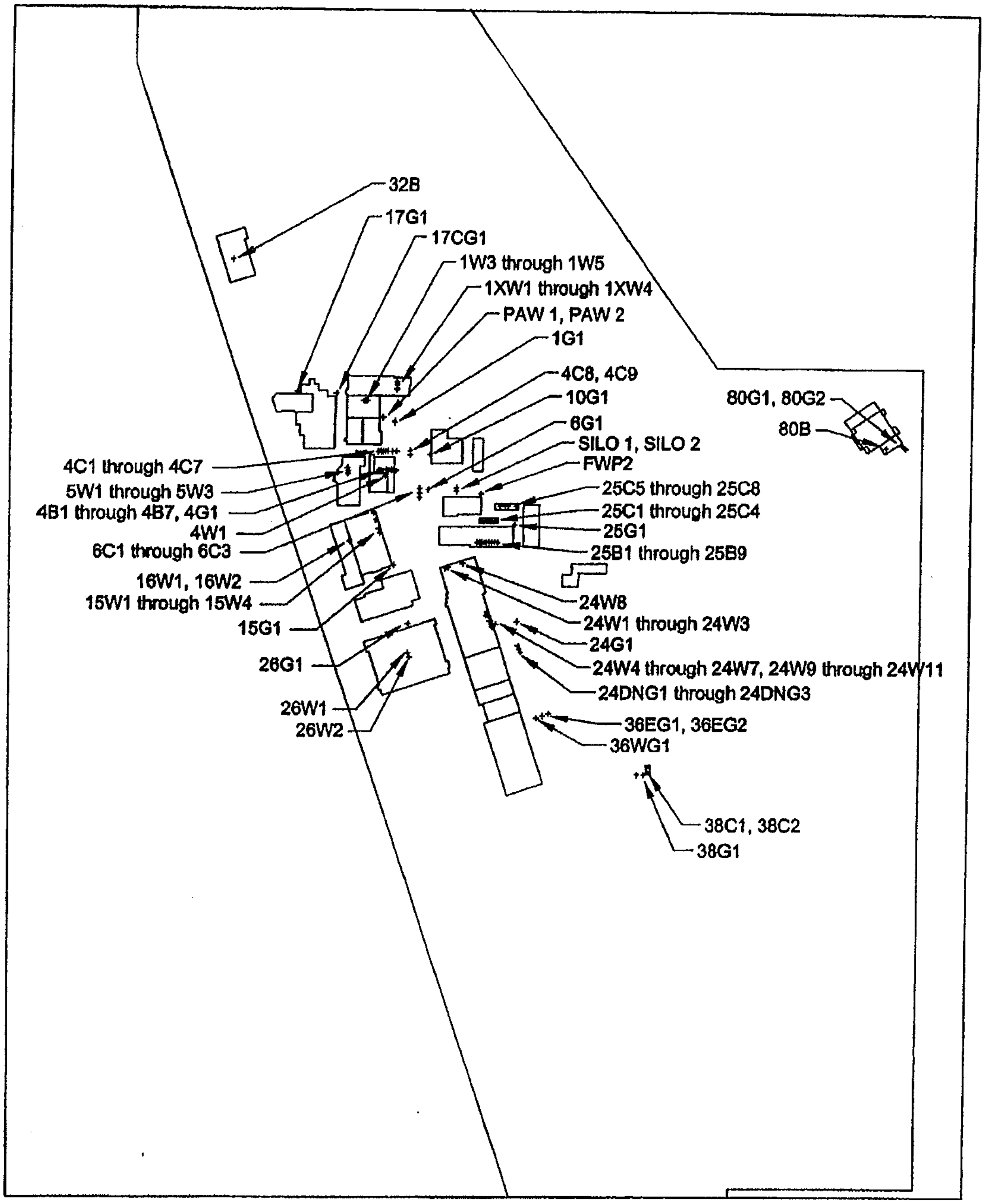


Figure L-2. Existing Point Source Locations

(Scrubbers, Boilers, and Emergency Generators Are Shown, See Facility Plot Plan for Locations of All Sources)

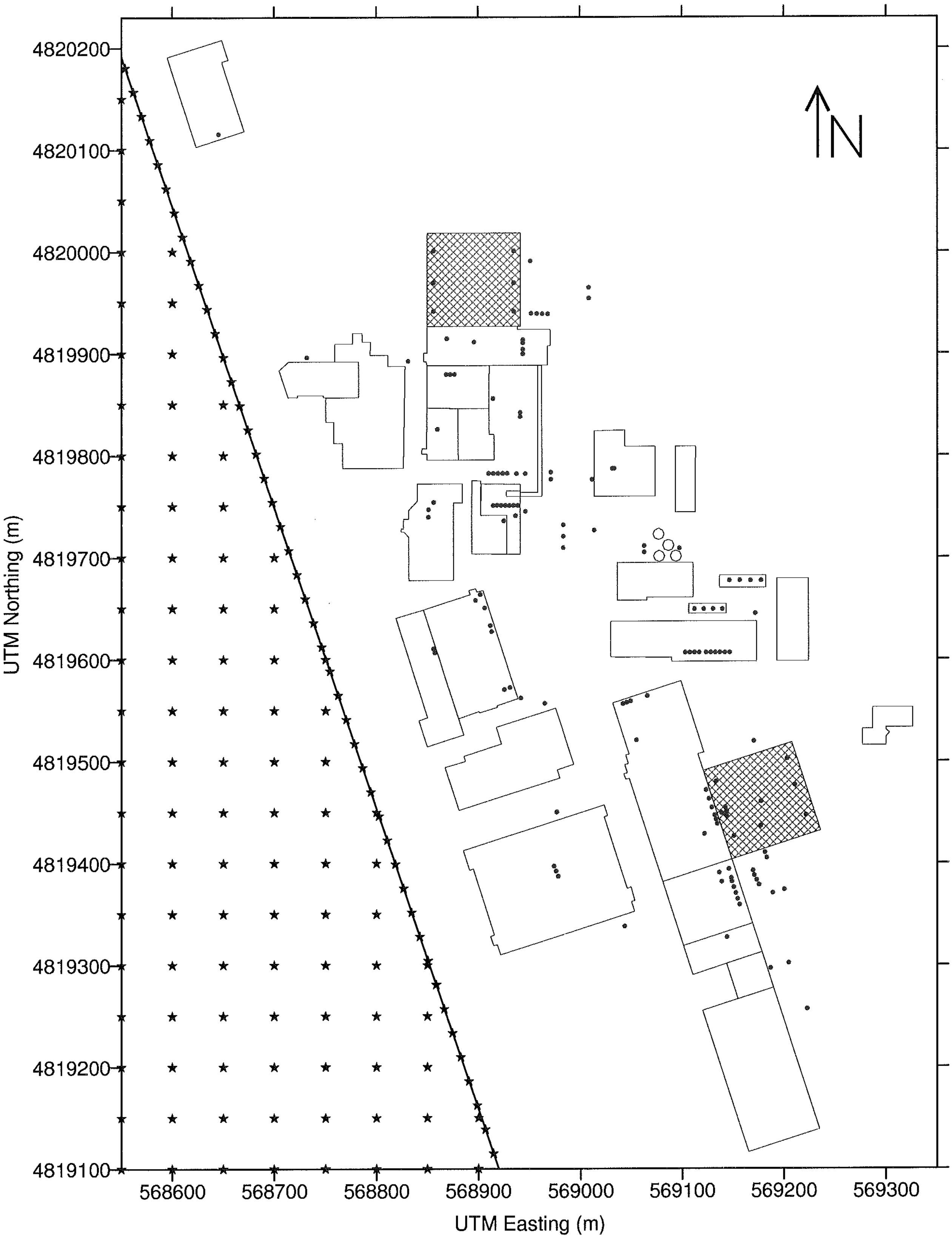


FIGURE L-3. POSSIBLE NEW BUILDING LOCATIONS (BLUE), WITH SOURCES (RED) AND RECEPTORS (STARS)

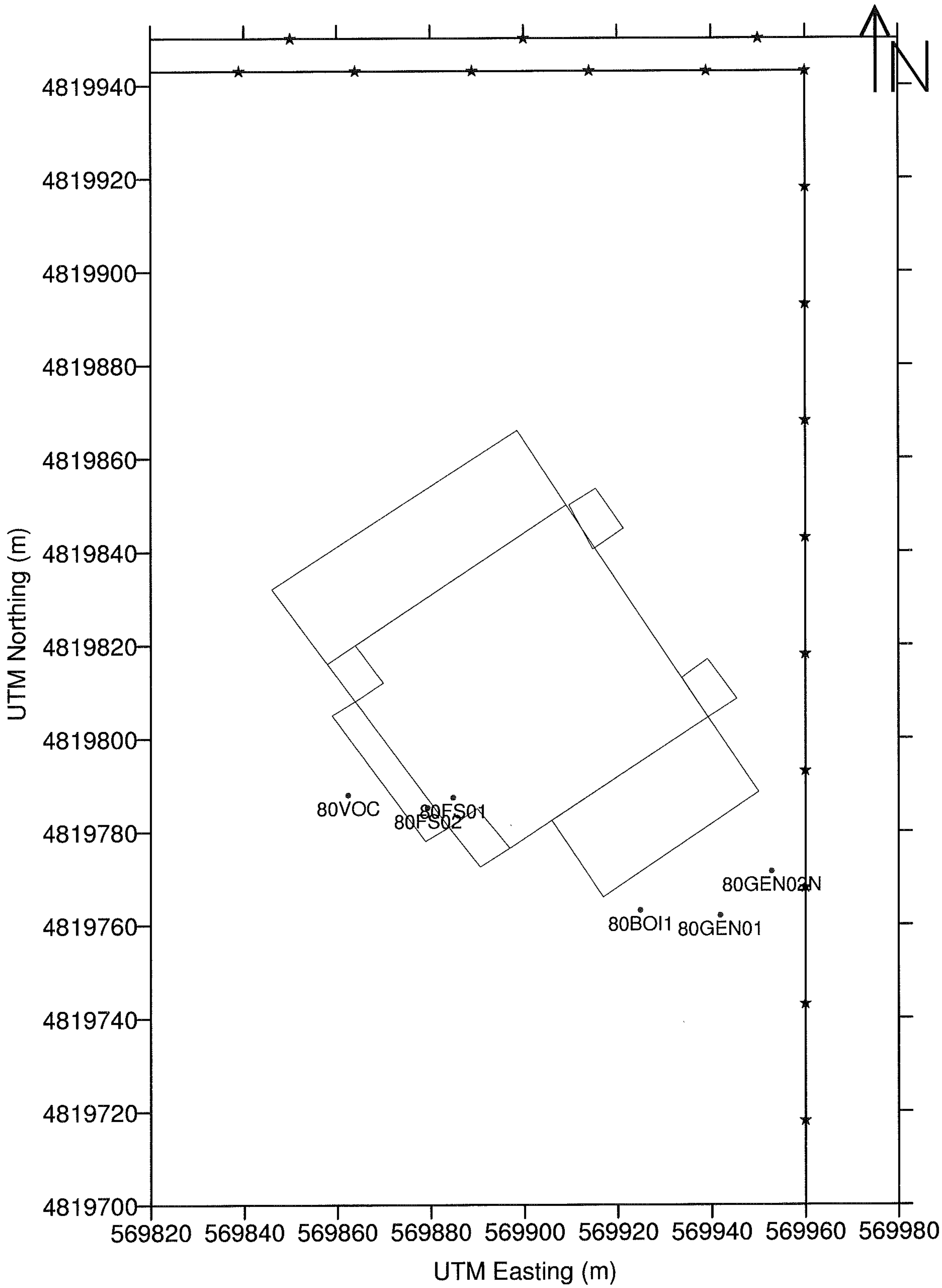


FIGURE L-4. BUILDING 80 POINT SOURCE LOCATIONS

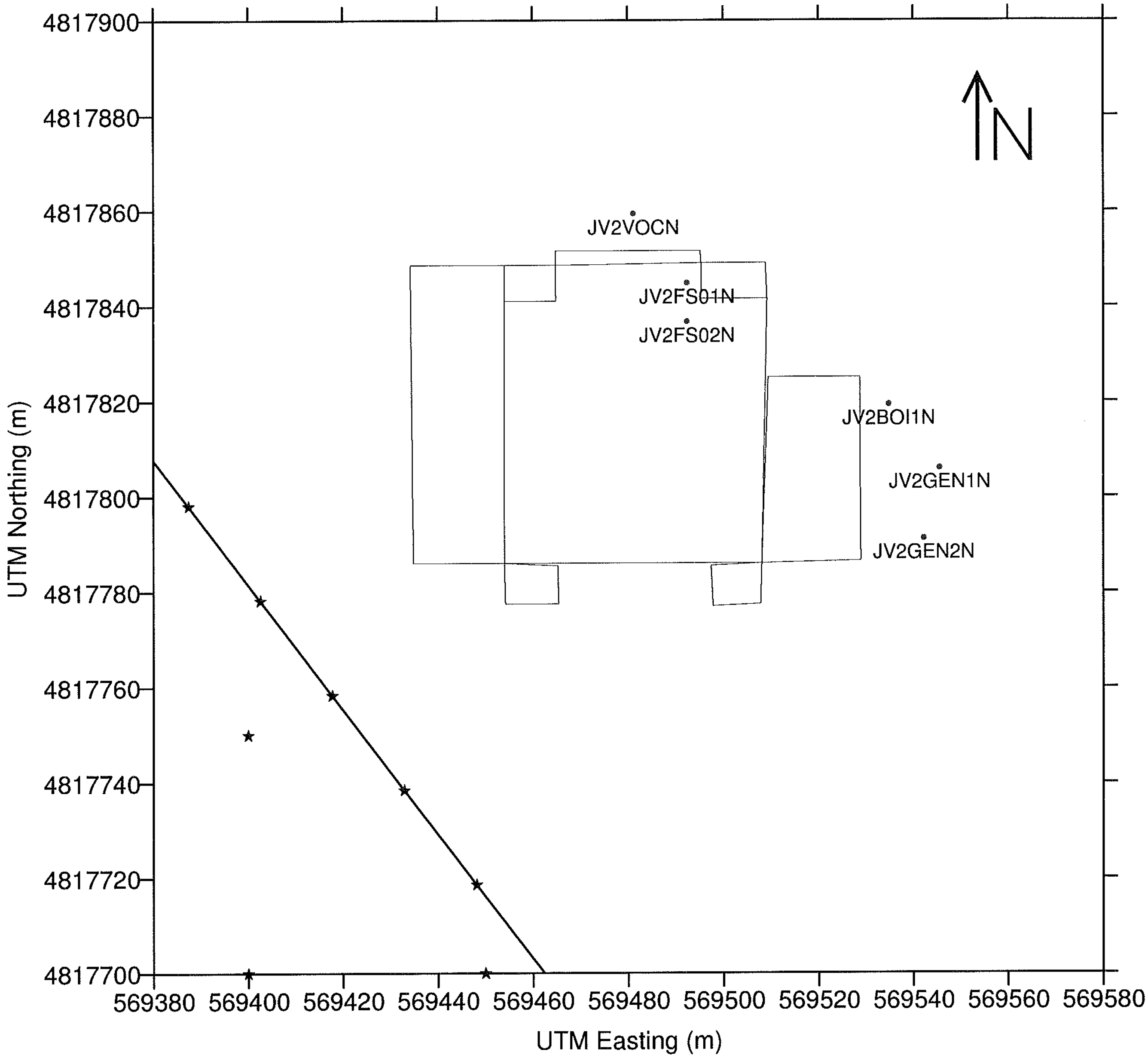


FIGURE L-5. PROPOSED BUILDING JV-2 POINT SOURCE LOCATIONS

Appendix M: Modeled Volume Sources and Parameters

TABLE M-1. VOLUME SOURCE PARAMETERS

Building/ Area	# of Volume Sources	Volume Source Horizontal Dimension (m)	Associated Structure Vertical Dimension (m)	Release Height (m)	Sigma y (m)	Sigma z (m)
22	2	37.09	10.06	5.03	8.63	4.68

TABLE M-2. PM10 FUGITIVE EMISSION RATES

Source	Building/ Area	PM10 (lb/yr)
Water Services	22	5,030

FIGURE M-1. VOLUME SOURCE LOCATIONS